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Design Analysis Cover Sheet

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2. DESIGN ANALYSIS TITLE ESF GROUND SUPPORT - STRUCTURAL STEEL ANALYSIS (SCPB: N/A)			
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12. REMARKS			
<p>1. TBV-193-ESF: Seismic design values for steel sets to be verified.</p> <p>2. TBD-147-ESF: Thermally-induced stresses in the steel sets (or lining) to be determined.</p> <p>3. TBD-154-RDR: Upgrades (if needed) to linings and ground supports due to a credible explosion and fire will be determined after completion of risk assessment.</p> <p>4. TBV-069-DD: Rock mass strength estimates for TSw1 and TSw2 (for all rock categories 1-5) are non-qualified and to be verified.</p> <p>5. TBV-073-DD: Depth of stations analyzed in Reference 5.20 to be verified and may affect rock loads.</p> <p>6. TBD-146-ESF: Thermal load requirements to be determined later for design of steel sets.</p>			

Design Analysis Revision Record

Complete only applicable items.

1.

Page: 2

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2. DESIGN ANALYSIS TITLE

ESF GROUND SUPPORT - STRUCTURAL STEEL ANALYSIS

3. DOCUMENT IDENTIFIER (Including Rev. No.)

BABEE0000-01717-0200-00003 REV 02

4. Revision No.

5. Description of Revision

02

Main body of analysis: Miscellaneous editorial revisions. Revised sections 4.2, 7.1, 7.7, 8.3 to reflect the ESFDR changes. Revised Section 6.5 to include Software Configuration Management. Revised sections 8.7.3 III.E and 8.7.10 to reflect changes made to the W8 x 31 baseplate offset and finite element analysis. Revised Section 8.5 E to reflect changed tie rod spacing.

Attachment III: Deleted pages III-63 and III-64, (replaced by III-65) and pages III-73, III-74, and III-75 (stiffeners not required). Revise page III-60 for hole size. Revised pages III-65, III-67, III-68, III-69, III-70, III-71, and III-72, to reflect the 3/4-inch chamfer of the concrete invert segment curb. Revised page III-76 to delete stiffeners. Revised pages III-82, III-83, and III-84, to reflect 3/4-inch chamfer and determine offset based on bearing pressure. Revised page III-102 to reflect changed fillet weld thickness. Revised page III-113 to remove shear tab. Attachment VII: Revised pages VII-3 and VII-4 to reflect changed tie rod hole group spacing and tie rod spacing. Attachment IX: Revised page IX-6 to reflect changed tie rod hole group spacing and tie rod spacing. Revise page IX-16, IX-17, and IX-18 to remove stiffeners. Attachment X: Revised entire contents to reflect the 3/4-inch chamfer of the concrete invert segment curb.

1. PURPOSE

- 1.1 The purpose and objective of this analysis are to expand the level of detail and confirm member sizes for steel sets included in the Ground Support Design Analysis, Reference 5.20. This analysis also provides bounding values and details and defines critical design attributes for alternative configurations of the steel set. One possible configuration for the steel set is presented. This analysis covers the steel set design for the Exploratory Studies Facility (ESF) entire Main Loop 25-foot diameter tunnel.
- 1.2 This analysis includes design calculations for the following ground support structural members, components, and features. Also included are associated tolerances, design sketches, and computer output data (attachments where calculations are found are in parentheses after each item):
- A. Steel Sets (I, III.A and VIII)
 - B. Steel lagging (III.B)
 - C. Tie rod and pipe spacer (III.D)
 - D. Steel set foot plate (III.E)
 - E. Steel set connection to insert (III.G)
 - F. Connection between steel set segments (III.G)
 - G. Inserts (III.C)
 - H. Steel set foot segments (III.H and III.I)
 - I. Shim plates (III.K)
 - J. Steel wedges (III.L)
 - K. Jacking bracket assembly and bolted connection to steel set (III.C and VI)
 - L. Tolerances (VII)
 - M. Summary of Design Sketches (IX)
 - N. FLAC Computer Output (II)

2. QUALITY ASSURANCE

- 2.1 The quality assurance (QA) classifications for structural steel ground support in this analysis are presented in QA Classification Analysis of Ground Support Systems, Configuration Item (CI): BABEE0000 (Reference 5.5).
- 2.2 The following structural steel ground support components are permanent and are classified QA-1 and QA-5:
- A. Steel set
 - B. Steel lagging
 - C. Tie rod and pipe spacer
 - D. Steel set foot plate
 - E. Steel set connection to insert
 - F. Connection between steel set segments
 - G. Insert

- H. Steel set foot segments
- I. Shim plate

- 2.3** Wedges, blocking, backfill or other materials placed in voids to transfer the rock load to the steel sets are considered to be non-quality affecting. (In commercial tunnels, blocking and wedges are typically made from timber; material strength is not considered to be a critical parameter.) These materials can be thought of as a substitute for rock originally occupying the void space, for which there is no relevant QA classification.
- 2.4** The following structural component is temporary and is not subject to the requirements of the project QA program: jacking bracket assembly and bolts used for the connection to steel set.

The jacking brackets and connection will be used during installation of steel sets only. Since the brackets have no permanent ground support function, they are not considered important to waste isolation or radiological safety.

3. METHOD

- 3.1** The steel set is analyzed for two basic conditions:
- 3.1.1** Installation/jacking process associated with erecting the steel sets after the ground has been excavated by the tunnel boring machine (TBM)—the computer software STAAD-III/ISDS (See Section 6, Use of Computer Software) is used to analyze steel sets and verify size of steel members as noted in Section 3.2.
 - 3.1.2** Long-term rock load condition—the long-term rock load analysis, including utility and seismic loads, was determined in ESF Ground Support Design Analysis (Reference 5.20). The resulting forces and moments were then used for the design of the steel set and components, noted in Section 3.2.
- 3.2** The steel set and other components listed in Section 1.2 are designed by hand calculations and computer analyses using the results of the ESF Ground Support Design Analysis (Reference 5.20) outputs, installation/jacking loads, and other inputs listed in Section 4.

4. DESIGN INPUTS

4.1 DESIGN PARAMETERS

- 4.1.1** Seismic - Mean Peak Horizontal and Vertical Acceleration = 0.37g (TBV-193-ESF). (Appendix A, Page A-2, Table A-2, Reference 5.16).

4.1.2 Rock Mass Properties (Reference 5.20, Pages 5 through 10) as used in design of lagging (Attachment III.B):

Geologic Unit	Mean Density		Minimum Friction Angle ⁽¹⁾
	Kg/m ³	lb/ft ³	
TCw	2115	132	53°
PTn	1268	80	40°
TSw1	2207	138	41°
TSw2	2257	141	49°

(1) Friction Angles are non-qualified data (TBV-069-DD)

4.1.3 Precast Concrete Dimensions - Drawings (References 5.7 and 5.8). Dimensions used in this analysis were:

- Curb face angle = 31.01° (\pm) 0.02°
- Invert segment width = 48 in. (1220 mm)
- Curb width = 7 ½ in. (191 mm) (Bearing width = 7 ½ in. - ¾ in. = 6 ¾ in)
- Chamfer ¾ in. (19 mm) on front of curb face
- Notch dimension on back of curb face = ½ in. x 3 in. (13 mm x 76 mm)
- Minimum side cover on bars = 1½ in. (38 mm)
- Base thickness = 28⅞ in. (715 mm)
- Curb rebar is as shown on References 5.7 and 5.8

4.1.4 The configuration of the steel sets was developed through numerous meetings and discussions between the Architect/Engineer (A/E) and Constructor and previous revisions of this analysis. Details were refined to accommodate construction methods and the installation processes.

4.1.5 The dimensions for the jacks used in this analysis for the design of the jacking bracket are from References 5.18 and 5.19 and are as follows (see Attachment VI):

25 ton jack for W8 steel set and 15 ton jack for W6 steel set:

Feature	25 Ton Jack (W8)		15 Ton Jack (W6)	
	HSR-258T	HSR-2510T	HSR-156T	HSR-1510T
Capacity	25 Ton	25 Ton	15 Ton	15 Ton
Stroke	8¼ in.	10¼ in.	6 in.	10 in.
Closed Height	12¾ in.	14¾ in.	10 11/16 in.	14 11/16 in.
Body Dimension	3⅝ in.	3⅝ in.	2¾ in.	2¾ in.

4.1.6 ESF Tunnel Main Loop maximum grade is 2.567 percent (Reference 5.12).

- 4.1.7 Not used.
- 4.1.8 Not used.
- 4.1.9 ESF Tunnel Main Loop Diameter = 7.62 meters (25 feet) nominal (Reference 5.12).
- 4.1.10 Force results in steel set from ESF Ground Support Design Analysis (Reference 5.20). Axial forces, moments and shears are provided at various locations (nodes) throughout the steel set. This output from Reference 5.20 has been included as Attachment II to the analysis.
- 4.1.11 Not used.
- 4.1.12 Specified Compressive Strength of Concrete $f'_c = 34.5$ MPa (5,000 pounds per square inch [psi] Reference 5.21).

4.2 CRITERIA

The following design criteria, applicable to this analysis, were developed in response to requirements in the Exploratory Studies Facility Design Requirements (ESFDR) document (Reference 5.16).

- 4.2.1 The permanent and temporary components of the ESF structural steel ground support system shall be designed to withstand the applicable seismic environment specified in Appendix A of the ESFDR. The seismic loads were determined in the analysis of Reference 5.20 (also see Attachment II), and the steel sets were designed (Attachment III) to withstand these loads (ESFDR 3.2.1.2.1.2.A).
- 4.2.2 ESF non-permanent structural steel ground support items shall be designed for a 25-year maintainable service life. ESF permanent structural steel ground support items shall be designed for a 150-year maintainable service life. These criteria are addressed (see Section 7.1) by the selected design of the steel sets and accessories using exposed carbon steel W-shape bolted ring beams with channel lagging which allow for ease of accessibility for maintenance and/or replacement (ESFDR 3.2.1.2.2.A and B).
- 4.2.3 The ESF structural steel ground support system shall be designed in compliance with the applicable requirements contained in DOE Order 6430.1A. The applicable criteria, i.e., Division 1 (General Requirements), Sections 0111-1 (General), 0111-2 (Loads), 0111-3 (Structural Systems for Buildings and Other Structures), 0111-99 (Special Facilities); Division 5, Sections 0512-1 (Structural Steel for Buildings and Other Structures), and 0532 (Metal Fastenings); and Division 13, Sections 01300-1 (Coverage and Objectives), and 01300-3.2 (Safety Class Items) are addressed throughout this analysis (ESFDR 3.2.1.2.4.C).

- 4.2.4** Records shall be developed and maintained, including as-built documentation, for location and description of the ESF structural steel ground support systems. This criterion is addressed in Section 7.1 with appropriate requirements for as-built documentation to be furnished by the Constructor included in the construction specification for the steel sets (ESFDR 3.7.1.2.B).
- 4.2.5** The ESF structural steel ground support system will support the testing requirements. This criterion is addressed (see Sections 7.1 and 7.7) by spacing and configuring the steel sets and lagging to allow access to the rock, as needed, to accommodate testing requirements (ESFDR 3.7.3.1.A).
- 4.2.6** The ESF structural steel ground support system will be compatible with the excavation methods and equipment. This criterion is addressed (see Section 7.1) by selecting a steel set and lagging system that is compatible with the tail shield configuration of the Tunnel Boring Machine (TBM) (ESFDR 3.7.3.1.D).
- 4.2.7** The ESF structural steel ground support system shall incorporate the use of noncombustible and heat resistant materials in the design. This criterion is addressed (see Sections 7.1 and 7.7) by specifying carbon steel for all permanent components of the steel set assemblies (ESFDR 3.7.3.1.E).
- 4.2.8** The ESF structural steel ground support system shall limit the use of selected tracers, fluids, and materials. This criterion is addressed (see Sections 7.1 and 7.7) by limiting the use of cementitious, organic, and combustible materials. Carbon steel is used as the primary ground support material, and the use of wood wedges and blocking is minimized and will be recovered to the extent practical (ESFDR 3.2.1.2.3.B).
- 4.2.9** The ESF structural steel ground support system shall be designed to permit periodic inspection, monitoring, testing, and maintenance, as necessary to evaluate their readiness and to ensure continued function. In addition, the ESF structural steel ground support system will be designed and installed throughout the main access openings and all alcove transition zones to reduce the potential for deleterious rock movement or fracturing. This criteria is addressed (see Sections 7.1 and 7.7) by the selection of bolted structural steel sets, lagging and accessories for the primary ground support system under the worst case rock load conditions. In addition, Reference 5.20 analyzes the potential for deleterious rock movement or fracturing. Finally, the ground support system, once installed, will be readily accessible for routine observation, maintenance, and/or replacement in whole or in part to ensure continued function (ESFDR 3.7.3.1.F and G).
- 4.2.10** The ESF structural steel ground support system shall be designed to accommodate anticipated ground conditions utilizing available site data, to have the capability to be supplemented as required when identified through additional site characterization data and analyses, and to have sufficient flexibility to allow adjustments where necessary to accommodate specific site conditions encountered during excavation

or identified through in situ monitoring and testing. These criteria are addressed (see Section 7.1) by the selection of bolted structural steel sets, lagging and accessories for the primary ground support system under the worst case rock load conditions as developed in Reference 5.20. In addition, this type of ground support system provides flexibility by allowing adjustment to the supports (or supplementing the supports with additional supports as needed) to accommodate rock conditions encountered (ESFDR 3.7.3.1.I, J, and K).

- 4.2.11** The ESF structural steel ground support system shall be designed to meet predicted thermal and thermomechanical response of the host rock, surrounding strata, and groundwater system for the site characterization heater tests. This criteria will be addressed when thermal load criteria have been established (TBV-146) as a result of the heater alcove tests. Thermal effects will be incorporated into the Reference 5.20 analysis, and then translated into changes to the design of the steel sets and accessories, if needed (ESFDR 3.7.3.1.L).

4.3 ASSUMPTIONS

4.3.1 Not used.

4.3.2 Not used.

4.3.3 Not used.

4.3.4 Not used.

4.3.5 Not used.

4.3.6 Credible fire and explosion design bases for the repository design are to be determined (TBD-154-RDR). However, the design of the steel sets for the ESF does not preclude the future incorporation of design features which would mitigate the effects of a credible fire or explosion in the repository.

4.4 CODES AND STANDARDS

4.4.1 American Concrete Institute (ACI)

ACI 318-89	Building Code Requirements for Reinforced Concrete (ACI 318-89, Revised 1992) and Commentary (ACI 318R-89, Revised 1992).
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ACI 301-89	Specifications for Structural Concrete for Buildings
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4.4.2 American Institute of Steel Construction (AISC)

AISC M016-89 AISC Manual of Steel Construction, Allowable Stress Design, Ninth Edition (First Revised Printing, January 1991)

4.4.3 American Society of Mechanical Engineers (ASME)

ASME B18.5-90 Round Head Bolts (Inch Series)

4.4.4 American Society for Testing and Materials (ASTM)

ASTM A6/A6M-94a Standard Specification for General Requirements for Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use

ASTM A36/
A36M-94 Standard Specification for Carbon Structural Steel

ASTM A53-94 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

ASTM A307-94 Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength

ASTM A325-94 Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 kips psi ksi Minimum Tensile Strength

ASTM A490-93 Standard Specification for Heat-Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength

ASTM A563-94 Standard Specification for Carbon and Alloy Steel Nuts

ASTM F436-93 Standard Specification for Hardened Steel Washers

4.4.5 American Welding Society (AWS)

AWS A5.1-91 Specification for Carbon Steel Electrodes for Shielded Metal Arc Welding

AWS D1.1-94 Structural Welding Code-Steel, Thirteenth Edition

4.4.6 Not used.

4.4.7 Not used.

4.4.8 United States Department of Energy (DOE)

DOE 6430.1A General Design Criteria

5. REFERENCES

- 5.1** Subsurface Fire Hazard Analysis, BABFAH000-01717-0200-00121 REV 00.
- 5.2** Impact Review Action Notice, J. Pye to D. Rogers, August 2, 1995.
- 5.3** Commercial Pantex Sika, Inc. Catalog, Structural Steel Supports, no date.
- 5.4** Subsurface General Construction, BAB000000-01717-6300-01501 REV 04.
- 5.5** QA Classification Analysis of Ground Support Systems (CI: BABEE0000), BABEE0000-01717-2200-00001 REV 02.
- 5.6** Not used.
- 5.7** Rail Placement Invert Segments - B, Plan & Sections, Drawing BABFCC000-01717-2100-41100 REV 03.
- 5.8** Rail Placement Invert Segments - A, Plan Sections & Details, Drawing BABFCC000-01717-2100-41099 REV 03.
- 5.9** Not used.
- 5.10** *Software Requirements Document for Structural Analysis and Design/Integrated Structural Design System (STAAD-III/ISDS)*, Version 4-8 MB, Rev. 16.0, Computer Software Document Number: SRD-02, Revision 0, Computer Software Configuration Item (CSCI) Number 20.93.3002-AAU4-8MB.
- 5.11** Not used.
- 5.12** ESF Layout Calculation, BABEAD000-01717-0200-00003 REV 03.
- 5.13** Not used.
- 5.14** Not used.
- 5.15** Retrieval Conditions Evaluation, BCA000000-01717-5705-00003 REV 00.
- 5.16** Yucca Mountain Site Characterization Project, *Exploratory Studies Facility Design Requirements*, Rev. 02, YMP/CM-0019.

- 5.17 Beer, F. P. and E. R. Johnston, Jr., Vector Mechanics for Engineers STATICS AND DYNAMICS, McGraw-Hill, NY, 1962.
- 5.18 Simplex Catalog SC101, Hydraulic and Mechanical Power, 1995.
- 5.19 TK SIMPLEX Catalog, Hydraulic and Mechanical Jacks for Industry, 1990.
- 5.20 ESF Ground Support Design Analysis BABEE0000-01717-0200-00002 REV 00 (TBV-069-DD, TBV-073-DD, TBD-146-ESF and TBD-147-ESF).
- 5.21 Precast Concrete Specification, BABFCC000-01717-6300-03480 REV 00.
- 5.22 Non-Gassy Mine Classification Analysis, BABE00000-01717-0200-00115 REV 00.

6. USE OF COMPUTER SOFTWARE

- 6.1 Basis for Computer Use: The steel set (W8 or W6 shape) is a symmetrical arch frame which is a statically indeterminate structure subject to a variety of loading conditions. The general approach to the problem of analysis of statically indeterminate structures with different loading conditions is to utilize the accuracy and speed of the computer to efficiently derive the forces, reactions and moments for the steel set and the size of the W8 or W6 shape using an appropriate indeterminate structural analysis.
- 6.2 Computer inputs and outputs are presented in Attachments I and II. The steel set W8 or W6 shape is analyzed and initially checked by computer in these attachments. The initial computer check is verified by hand calculation. The permanent attachments and connections are designed by hand calculations (Attachment III) using the maximum axial forces, shears, and moments from the computer analysis output.
- 6.3 Computer hardware used for this analysis - IBM Compatible 486/33 MHz.
- 6.4 STAAD-III/ISDS, Version 4-8MB, Rev. 16.0 (Reference 5.10), CSCINo. 20.93-3002-AAu4-8MB, is the computer software used for this analysis. The computer software has been validated, verified, and controlled in accordance with applicable Management and Operating Contractor procedures.
- 6.5 The computer software used in this analysis is appropriate for this application since the STAAD-III program was specifically selected and validated for the purpose of analyzing and designing the steel sets and accessories. The program was used within the validated range as described in the verification and validation documentation. The program was obtained from Software Configuration Management in accordance with appropriate procedures.
- 6.6 Attachment II contains results of computer runs presented in Reference 5.20. For FLAC Version 3.22 Verification and Validation (V&V) information, see Reference 5.20.

6.7 In addition to the software noted above (STAAD-III, FLAC), computational support software as defined in Quality Administrative Procedure, QAP-SI-0, *Scientific and Engineering Software*, used in this analysis was Lotus 1-2-3, Release 4 for Windows. The spreadsheet feature of Lotus 1-2-3 was used in Attachment III.I to tabulate and perform repetitive calculations for shear and sliding resistance calculations at the base of the steel sets. User defined formulas, inputs and results are shown in the attachment. Also, WordPerfect Release 5.2+ for Windows was used throughout the analysis to tabulate data (no calculations) and present information.

7. DESIGN ANALYSIS

7.1 INTRODUCTION

Steel sets comprised of wide-flange structural shapes have been selected as an appropriate ground support system (including general configuration and spacing) in the ESF Ground Support Design Analysis (Reference 5.20).

The ESF ground support structural steel analysis is based on two conditions. The first condition is the installation/jacking process associated with erecting the steel sets after the ground has been excavated by the TBM. The second condition is the long term operating conditions for the steel set, which includes the long term rock loading and the various utility service support loads. Of these two conditions, the second (Reference 5.20) establishes the starting point for the analysis of the structural steel.

The circular shape of the steel set is based on the excavated diameter of the tunnel as set by the TBM. Spacing of the steel sets was established (in Reference 5.20) at 1.22 m (4 feet) center to center, nominally, based on construction and equipment limitations associated with the weight and size of the ground support segments and nominal steel set sections commonly associated with a tunnel of this size and the excavation method. Where weaker ground is encountered requiring heavier steel support, the spacing of the steel sets is reduced to 0.61 m (2 feet). With this reduced spacing the steel set configuration would remain the same as that used at 1.22 m (4 feet) spacing, but the lagging span would decrease to provide a stronger support system for the higher rock loads.

The configuration of the steel set used in this analysis was developed during (undocumented) review meetings between the A/E and Constructor and previous revisions of this analysis. A multiple piece set was selected to facilitate handling and erection within the tunnel. The steel set was configured into three large segments (one crown segment and two wall segments) and two small segments, i.e., the foot segments (see Steel Set Detail, Alternate I, Attachment IX). The three large segments provide ground support for the tunnel crown and walls. The two small segments are an extension of the wall segments and have a foot plate on one end that rests on a precast concrete invert foundation. An insert and shims or shims alone are placed between the wall segments and foot (small) segments upper plates during expansion of the steel set. As an alternative steel set configuration (see Steel Set Detail, Alternate III, Attachment IX), the two wall segments are extended and the two foot segments that rest on

the precast concrete invert foundation are reduced. Inserts and shims are placed between the wall segments and the foot segment upper plate during the expansion/jacking process.

As shown in Attachment IX, Alternate I consists of a longer foot segment with a jacking bracket near the upper end. A similar jacking bracket is attached to the lower end of the wall segment. The brackets are aligned such that the reaction line of the jacking force passes through the center part of the foot segment base plate, thus eliminating any eccentricity on the foot segment base plate and ensuring stability of this member for personnel safety during the jacking operation. In addition, only shim plates are used between the foot segment and the wall segment.

Alternate III in Attachment IX represents the jacking bracket design as used in the tunnel to date. This configuration requires an insert segment and shim plates between the foot segment and wall segment. The jacking brackets, though similar in design to Alternate I, are aligned such that an eccentric load is applied to the foot segment. To counteract this load and to ensure stability of the foot segment during jacking, a leg was added to the base plate to engage the inner face of the invert segment curb.

The final configurations of the steel set with detailed dimensions as analyzed herein are shown in Attachment IX. The configuration shown will provide relatively unrestricted access to the host rock to accommodate the needs of the testing community. The use of bolted carbon steel sets will also provide a ground support system compatible with the anticipated configuration of the repository. In addition, as shown in this analysis, the steel set system will control the configuration and stability of the opening, will protect personnel and equipment against potential falls of loose rock, will reduce the potential for deleterious rock movement or fracturing, and will be compatible with the excavation methods and equipment (TBM).

The tunnel is judged to not be a corrosive environment because of the generally dry conditions (Reference 5.15, Section 6.3.2.2), therefore corrosion allowance beyond reserve capacity of the steel members is not considered necessary.

Although individual steel sets cannot be guaranteed to last for the design life of 150 years they have been designed for a "maintainable life" of 150 years. This means that steel sets exhibiting obvious signs of deterioration or distress can accommodate removal and replacement either with other steel sets of like kind or with other means of ground support. Similarly, the steel sets as presently designed do not preclude future methods of rock support for repository loads, e.g., a concrete lining with steel sets remaining in place as non-functioning members.

It should be noted that the detailed configuration of the steel sets and accessories as presented in this analysis represent only a few of the many acceptable alternatives that could be considered for steel sets to be used in the ESF. The Constructor will be encouraged to develop and submit alternative details to facilitate construction, which will be subject to A/E approval, as long as the critical attributes as identified in Section 8.5 are met. In addition, the construction specifications will require that the Constructor develop and maintain records,

including as-built documentation, for location and description of all structural support systems, e.g., steel sets.

7.2 STEEL SET JACKING

The purpose of jacking the steel set is to bring the profile of the steel set and lagging into positive contact with the excavated profile to support rock loads resulting from the excavation process. The steel set was analyzed to establish the maximum jack forces for the jacking operation based on the jacking bracket configuration as depicted in Attachment IX. A (STAAD-III) computer analysis was performed to determine the effects of various jacking forces: 50^T , 30^T , 25^T , 20^T , and 15^T on the steel set and what the resulting stress ratios were for these forces using the AISC code check option of the STAAD-III software. Simultaneous jacking and one-sided jacking were analyzed to determine the governing condition. The computer input files and output results for jacking conditions are presented in Attachment I for the W8 x 31 and in Attachment VIII for the W6 x 20. The explanations of the loading conditions including loading points in the model, loading values and location of supports are presented in detail in Attachment I.

The jacking analysis used a structural model of the steel set with joints and members that accurately describe the steel set configuration as presented in Attachment IX. Supports/contact points were modeled to reflect the steel set's behavior during the jacking process. At the initial stage of the jacking operation, the steel set starts to make contact with the tunnel walls that provide horizontal support for the steel set from the bottom to about the spring line level. The distance between these horizontal supports is modeled to be at each fifth node (about 6 feet, engineering judgement based on observed field conditions), which conservatively reflects the positive contact requirements for steel set installation. No vertical support is provided below the spring line due to the fact that the steel set is moving upward during the jacking operation and only supports above the spring line could restrain this movement. As the jacking force increases, more contact is made at about mid distance between the spring line and the crown where the support has a horizontal as well as a vertical component. In the final stage, the crown makes contact with the steel set providing the vertical restraint required, which is represented in the model by two vertical supports close to and symmetric about the crown.

The self weight of the steel set was increased in the analysis to account for the additional weight of lagging and other components. No frictional forces were considered as part of the jacking analysis to ensure that the results were conservative and maximum stress for design could be obtained. The relative conservatism of the results is indicated by comparing preliminary strain gage data from the steel sets to design stresses (see Attachment IV).

7.3 LONG-TERM ROCK LOADING AND UTILITY SERVICES

The long-term rock loading analysis results (including utility and seismic loads) are included in Attachment II and were determined in Reference 5.20.

7.4 DESIGN SELECTION PROCESS

The analyses to support the design selection/confirmation process for the structural members, components, and attachments (outlined in Section 1.2) are presented in detail in Attachments I, III, and VIII. Calculations for all structural members, components, and attachments are presented under appropriate headings (with a reference to representative subsection in Section 1.2) in those attachments. A summary of the conclusions from all attachments are found in Section 8.7.

7.5 BOLTED CONNECTIONS

Requirements for bolted connections using ASTM A307 (as a minimum) are provided below:

The bolted connections in this analysis were determined to be not slip-critical based on the fact that there is little impact, vibration, repetitive loads, load reversals, or high tensile forces in the steel set connections that would tend to reduce the friction between the joint plates (AISC M016, p. 5-270, Paragraph 5[a]). For this reason, torquing of the bolts will not be necessary beyond what AISC refers to as a "snug tight" condition.

A307 bolts will be installed to a snug tight condition in accordance with AISC (Codes and Standards 4.4.2). In AISC, p. 5-303, "snug tight condition is defined as the tightness that exists when all plies in a joint are in firm contact. This may be attained by a few impacts of an impact wrench or the full effort of a man using an ordinary spud wrench. In actuality, snug tight is a degree of tightness, which will vary from joint to joint depending upon the thickness and degree of parallelism of the connected material. In most joints the plies will pull together; however, in some joints, it may not be possible at snug tight to have contact throughout the faying surface area."

In the AISC Commentary to Specifications for Joints Using ASTM A325 and A490 bolts, a discussion is presented on why separate installation procedures are now provided for bolts that are not within the slip critical or direct tension category. "The intent in making this change is to improve the quality of bolted steel construction and reduce the frequency of costly controversies by focusing attention, both during the installation and tensioning phase and during inspection, on the true slip-critical connections rather than diluting the effort through the requirement for costly tensioning and tension testing of the great many connections where such effort serves no useful purpose. The requirement for identification of connections on the drawings may be satisfied either by identifying the slip-critical and direct tension connections which must be fully tightened and inspected or by identifying the connections which need be tightened only to the snug tight condition."

Quotations found in the preceding two paragraphs are extracted directly from AISC p. 5-273, Paragraph 8.(c) and p. 5-303 for joints not within the slip-critical range nor subject to tension loads, respectively. The steel set is designed to be in ring compression, therefore, the load transferred at the joint is primarily a compressive force. As the full rock load develops, this compression load will tend to force the plates into contact.

AISC Section M4. Erection, Paragraph 4, p. 5-90 states: "Lack of contact bearing not exceeding a gap of 1/16-in., regardless of the type of connection used (partial-penetration, groove-welded or bolted), shall be acceptable. If the gap exceeds 1/16-in., but is less than 1/4-in., and if an engineering investigation shows sufficient contact area does not exist, the gap shall be packed with non-tapered steel shims. Shims may be of mild steel, regardless of the grade of the main material."

Engineering judgment indicates that, where gaps may exist in steel set segment connections, a minimal ring compressive force will occur. As the rock loading increases, sufficient contact will develop between the plates of the steel set joints to adequately transfer the ring compressive force. As the design compressive force is attained, the plates may come together as noted above. Snug tightness shall be in accordance with AISC, p. 5-303 except that gaps between connection plates and between connection plates and shims may exceed 1/16-in. if plates or plates and shims make contact at any point in the connection plane. Bolted steel set joints are compression connections with only minor moment and shear loads. While they are considered critical to the performance of the set, the relatively low loading in comparison to the size of bolts selected reduces the need for special testing to verify material characteristics of the bolts.

The field drilling of holes larger than 5/16-in. in the steel set members for bolting of miscellaneous connections on steel sets shall be in accordance with AISC Sections J3.1 and J3.5, and will be subject to A/E approval.

7.6 WELDED CONNECTIONS

To ensure the adequacy of welded connections, welding shall be performed in accordance with the requirements of AWS D1.1 using E70XX 70 ksi tensile strength (minimum) electrodes. Welders and weld procedures shall be qualified for the electrode(s) used in accordance with AWS D1.1, Section 5.

The member welds shown in the details of Attachment IX experience relatively low shear stress. Additional weld lengths are provided for connection stability. The flange welds on the W-shapes at connecting plates are provided to ensure that the connection plate and the W-shape work together effectively under both static and seismic load conditions, even though the jacking loads, in most cases, result in the worst case shears at the joints. Welded connections of plates and W-shapes are subject to only minor shear loads due to long term rock load or jacking. While the welds are considered critical to the performance of the set, the amount of welding specified herein, in relation to the minor loading resisted by the welds, reduces the need for special inspections and/or tests to verify the weld filler material characteristics.

7.7 CREDIBLE FIRE AND EXPLOSION

The ground support system (steel sets) has not been designed for credible fire or explosion loads during construction or operation of the ESF. This approach is based on the Subsurface Fire Hazard Analysis (Reference 5.1) which concludes that the potential for an explosion in

the ESF is extremely unlikely. In addition, loss prevention and/or life safety concerns due to a credible fire during construction and operation of the ESF would be met by the (current and future) design of the fire suppression and alarm systems; the non-combustible nature of the ground support system; a ventilation system designed to meet life safety objectives; and the provision of refuge chambers. The ESF Design Basis Fire (DBF) is in the TBM itself (Reference 5.1), well ahead of the steel sets. If incorporated into the repository design, fire or explosion damage to the steel sets (if credible) would be localized, of short duration, and, at worst, might result in deformation of the steel sets and lagging but not total collapse of the tunnel. Repair and/or replacement of the steel sets may be needed, but would be relatively uncomplicated.

If a fire should occur in the ESF, it would be localized and of fairly short duration due to the fire suppression and alarm systems in place (see Section 4.3.6, above). AISC M016 (page 6-3) notes that the average temperature reading for steel members exposed to fire should not exceed 1000° F for columns and 1100° F for beams without considering insulating protection for the steel. Fire exposure of severity and duration sufficient to raise exposure temperatures above these limits would seriously impair the ability of the steel members to sustain loads. Although exposure temperatures could conceivably exceed the above limits during a fire, it is judged that fire-proofing of the steel sets and lagging is not required. Fire proofing would be costly, could interfere with the in situ site characterization testing, would obscure the ground support system thus preventing periodic inspection and maintenance, could interfere with incorporating the ground support system into the eventual repository, and would introduce additional undesirable cementitious materials into the ESF environment. In addition, should a fire occur in the ESF or in the repository, resulting in high exposure temperatures to the steel members and subsequent degradation of the steel sets or even localized (though unlikely) failure of the support system, the debris could (as noted above) be cleared and the ground support systems replaced within a reasonably short period of time, thus minimizing the impact on the ESF construction/operational activities and on the repository functions.

8. CONCLUSIONS

- 8.1 The ESF ground support steel set configuration and details analyzed herein are summarized in Attachment IX. The steel set member sizes and spacing used in the ESF ground support are presented in Table 14 of Reference 5.20.
- 8.2 Based on the jacking configuration presented in Attachment III.C, the maximum jack load/force on the W8 x 31 is 27 tons (Attachment I) and on the W6 x 20 is 17 tons (Attachment VIII). The jacking load may be applied to both sides of the steel set simultaneously or to only one side of the steel set.
- 8.3 The steel sets are adequate for use in the construction of a stable, functional opening with a 150 year maintainable life (see Section 7.1).

- 8.4 The installation tolerances for the steel sets along the longitudinal direction of the tunnel are presented in Attachment VII. The established tolerances contribute no significant decrease to the capacity of the steel sets or components.
- 8.5 As noted in previous sections, the results of this analysis present only a few of the many acceptable methods that could be used for steel sets in the ESF. The Constructor will be encouraged to develop and submit alternative solutions for A/E approval as long as minimum critical design attributes are met. For the purposes of this analysis critical design attributes are defined as those important design, material, and performance attributes as delineated herein that require verification to provide reasonable assurance that the item will perform its intended safety function. From these critical design attributes, (1) "critical characteristics" of the items are selected and verified through material dedication (separate analysis), and (2) identifiable and measurable or qualitative critical performance attributes necessary for the item to function as intended will be defined for development of installation and inspection requirements.

The Constructor shall incorporate the following minimum critical design attributes into alternative solutions submitted.

A. Member Sizes and Material Properties

The steel set members and materials shall be of the following (members or materials of equal or greater strength may be substituted):

1. Steel set ring beam members shall be either W8 x 31 or W6 x 20, consistent with rock conditions shown in Table 14 of Reference 5.20, with material properties conforming to ASTM A36.
2. Steel lagging shall be C8 x 11.5, with material properties conforming to ASTM A36.

B. Steel Set Configuration

The bend radius of the steel set shall be of uniform contour, shall facilitate placement, and shall be compatible with the nominal 25 feet - 0 in. diameter of the tunnel such that the set engages or contacts the rock perimeter (via the lagging when expanded or blocked into the final configuration) to the extent practical (i.e., consistent with standard industry practice).

1. The steel sets shall be founded on the curbs of the concrete invert segments (see Attachment III.E).
2. The steel sets shall be spaced based on the rock conditions encountered, either 2 feet, 4 feet, or 6 feet nominal (see Table 14 in Reference 5.20).

3. The quantity and location of steel set joints shall be determined by the Constructor, subject to A/E approval of shop drawings.

C. Lagging

Lagging shall be configured such that it can transfer the rock loads to the steel set ring beam.

Lagging details are shown in Attachment III.B.

D. Not used.

E. Tie Rods

Since the tie rods are primarily designed to carry tension loads, they shall be provided with a compression brace (pipe spacer) capable of maintaining the steel set spacing. Tie rod general arrangement will be as shown in Attachment III.D with the following critical attributes:

1. 35° maximum angle between tie rods ($\pm 1^\circ$)
2. 7° maximum from foot segment base plate
3. Locate at $\frac{1}{2}$ " inside of centerline of W-shape ($\pm \frac{3}{8}$ in.

F. Jacking/Expansion of Steel Sets

The steel sets shall be jacked into final position using hydraulic jacks or other means that will provide reasonably uniform expansion of the steel set against the tunnel walls and crown to provide positive contact to the extent practical, i.e., consistent with standard industry practice. The jacking process shall not overstress the steel set. The jacking brackets shown in Attachment III.C represent one jacking method that will work, but should not constrain the Constructor from developing other systems for expanding the steel sets that meet the requirements of this paragraph.

G. Connections

Connections and connecting components (plates, nuts, bolts, shims) shall be sufficient to provide continuity in the entire steel set when loaded (primarily) in ring compression.

Steel set joint connection details shall be as shown in Attachment III.G.

- 8.6 The ESF has been determined to be a nongassy tunnel (Reference 5.22), and therefore explosion from methane or other explosive gasses are not credible events. The Importance to Safety Ground Support and Lining items classified QA-1 and QA-5 begin their intended radiological safety function at the beginning of the repository phase when waste packages are placed. Therefore, the use of explosives during the construction of the ESF has no impact on

the design of steel sets to perform their intended safety function. The use, the amounts transported and stored, and the logistics and associated risk assessment of explosives in the potential repository have yet to be determined. Design for effects of explosions cannot proceed without the above determination being performed (TBD-154-RDR). However, current design does not preclude the installation of reinforcement to allow the linings and ground support to meet credible fire and explosion criteria developed and analyzed during Repository design.

8.7 SUMMARY OF CONCLUSIONS FROM ATTACHMENTS

8.7.1 Attachment I

- W8 x 31 selected is confirmed as an acceptable steel set member size for up to a 27 ton jack load
- Jacking centerline to be maximum of 6 in. from W8 X-X axis, based on the configuration used in Attachment III.C and shown in Attachment IX.
- One-sided jacking is acceptable.

8.7.2 Attachment II

- Output results from FLAC analysis (Reference 5.20), no conclusions.

8.7.3 Attachment III

- III.A: W8 x 31 steel set is adequate for up to a 27 ton jacking force and for rock loads, utility load, and seismic loads.
- III.B: C8 x 11.5 lagging is adequate for rock loads plus seismic loads.
- III.C: Jacking bracket assembly as shown is adequate for up to a 27 ton jack load for W8 x 31 and up to a 17 ton jack load for W6 x 20.
- III.D: $\frac{3}{4}$ -in. diameter tie rod spaced at 35° (in combination with 1½-in. diameter pipe spacer) is sufficient to laterally brace the steel sets.
- III.E: Steel set foot plate as shown is adequate for the average axial load in the steel set. Maximum offset allowed is 1 inch.
- III.F: Steel set foot segment as shown is adequate for up to a 27 ton jack load for W8 x 31 and up to a 17 ton jack load for W6 x 20.
- III.G: Steel set splice connection as shown is adequate.

- III.H: Steel set foot segment (2 alternatives) are stable under 27 ton (max.) jack load for W8 x 31 and 17 ton (max.) jack load for W6 x 20.
- III.I: Not used.
- III.J: Not used.
- III.K: Shim plate thicknesses and configuration as shown are adequate.
- III.L: Steel wedge as shown is adequate for blocking of steel set.

8.7.4 Attachment IV

- Impact Review Action Notice (no conclusions).

8.7.5 Attachment V

- CPS Structural Steel Supports Catalog (no conclusions).

8.7.6 Attachment VI

- Catalog cuts from jack manufacturer's catalog (no conclusions)
- Record of telephone conversation, definition of snug tight on bolts. Tension in bolt is negligible for snug tight condition.

8.7.7 Attachment VII

- Mill tolerances per AISC M016 and ASTM A6.
- Bending tolerances (see Attachment).
- Installation tolerances (see Attachment).
- Steel set is adequate to accommodate cumulative offset tolerances.

8.7.8 Attachment VIII

- W6 x 20 steel set is adequate for 17 ton jacking force (15 ton nominal) but not adequate for 20 ton jacking force.
- Jacking centerline to be maximum of 5 in. from W6 X-X axis.

8.7.9 Attachment IX

- Proposed design of steel sets components and accessories shall be as shown on the sketches of this attachment. However, Constructor may modify the following items (with A/E approval of shop drawings):
 - Steel set configuration (Pages IX-3, 4, 5, & 16)
 - Steel set joint locations (Pages IX-3 & 4)
 - Jacking brackets (Pages IX-3, 4, 5, 8, 13, 16, 17, 18, & 19)
 - Inserts (Page IX-4, IX-16)
 - Materials (Page IX-1)
 - Connections (Page IX-11 & 15)
 - Details (Pages IX-6, 9, 12, 14, 15 & 17)

8.7.10 Attachment X

- W8x31 baseplate is within the design limit stress (27 ksi, or 36 ksi with 1/3 allowable increase for seismic loading).

9. ATTACHMENTS

There are 10 attachments to this analysis.

ATTACHMENT	DESCRIPTION
I	Jacking Load Analysis
II	Rock Long-Term Load Computer Analysis Results
III	Steel Set Member and Components Design
IV	Impact Review Action Notice
V	CPS Structural Steel Supports Catalog
VI	Miscellaneous Reference Data
VII	Miscellaneous Shop Fabrication Tolerances and Steel Set Installation Tolerances
VIII	Structural Steel Set Using W6 x 20
IX	Summary of Design Sketches
X	Finite Element Analysis for W8x31 Baseplate

ATTACHMENT I

Jacking load analysis

TWO SIDED JACKING WITH VARIOUS SIZE JACKS APPLIED EQUALLY ON EACH SIDE

STLRV2 - Two sided jacking with 50 Ton, 30 Ton and 25 Ton jacking load applied at 47

TWO SIDED JACKING WITH 25 TON JACKING LOADS

STLRV3A - Jacking loads applied at 49°.
STLRV3D - Jacking loads applied at 51
STLRV3B - Jacking loads applied at 47° and member end moments released at splice locations.
STLRV3C - Jacking loads applied at 49° and member end moments released at the splice locations.
STLRV3A1 - Jacking loads applied at 47 with rock engagement at most joints (near the completion of the jacking process).
STLRV3A2 - Jacking loads applied at 47 with rock engagement at all joints (near the completion of the jacking process).

ONE SIDED JACKING WITH A 25 TON JACKING LOAD

STLRV4 - Jacking load applied at 47°.
STLRV4A - Jacking load applied at 49°.
STLRV4B - Jacking load applied at 51
STLRV4C - Jacking load applied at 47 , with member end moments released at the splice location.

ATTACHMENT I**PURPOSE AND DESCRIPTION**

The purpose for the computer analyses in this attachment is to determine the jack size to be used for the W8X31 steel sets, and then evaluate the W8X31 shape for stresses from the jacking process using the selected jack capacity under different jack loading conditions and jacking settings.

Computer analysis STLRV2 for jack capacities of 50, 30 and 25 tons was executed. Based on this computer analysis and hand calculations in Attachment III pages III-25 through III-27, a maximum size jack of 27 Tons was selected for the jacking operation.

With the jacking force established, the location of jacking loads were varied to simulate the angle range that the jacking forces may be applied to the steel set during the jacking process. Computer analyses were performed with the jacking force applied at 47, 49 and 51 degrees. The 47 and 49 degrees correspond to two different jacks that can be used (see the jack information sheet in this attachment, which is based on the attachment VI tables), and the 51 degree is based on the possibility of using a crown segment based on an angle of 84 degrees arc length instead of the typical 90 degrees. The 51 degrees angle is also the angle that defines the jacking load

position when no insert is used. Comparing the analyses: STLRV2, STLRV3A and STLRV3D for two side jacking, and the analyses: STLRV4, STLRV4A and STLRV4B for one side jacking, the conclusions are: (1). There is no difference between the stresses in the steel set caused by two side jacking and one side jacking (hence no further computer analyses for one side jacking are required), and (2). that the jacking at 47 degrees produces higher stresses in the steel set than the jacking force applied at 49 or 51 degrees, hence all the other analyses were performed with jacking force at 47 degrees. The difference between the stresses obtained from varying the angle is typically less than 2%, (4% overall), (see Summary of Computer Analyses for Jacking Loads for comparison). No other analyses were performed with jacking force application below 47 degrees because the small difference expected between the resulting stresses, if the jack was to be applied at a lower point.

In addition to the varying the angle of the jacking force application, computer analyses were performed to simulate the boundary conditions of the splice connections during the jacking process. Depending on when the bolts in the splice connection are tightened the connection may or may not be capable of transmitting moment across the splice during the jacking process. These two conditions were evaluated and the results from the various computer analyses revealed that if the bolts are not tightened, slightly higher stress levels are induced in the W8X31 steel set member when the splice connection acts as a pin connection (capable only of taking shear), versus the bolts being tightened and the connection being capable of transmitting moment through the

splice prior to starting the jacking process. Note computer analyses STLRV2, 3A, and 4, versus the corresponding computer analyses STLRV3B, 3C and 4C.

The initial contact/support points of the steel sets to the rock, is assumed to be at maximum 5 nodes which corresponds to approximately 6 ft. This is a conservative assumption, as compared to making positive contact with the rock in the tunnel crown and walls, as a result of 25 Ton jacking force. (See section 4.3.4)

Additional computer analyses were performed to simulate the jacking process as the steel set restraint changes from initial contact/support points with the excavated profile (as described in the above paragraph) to partial, and then full engagement with the rock. See computer analyses STLRV3A1 and A2.

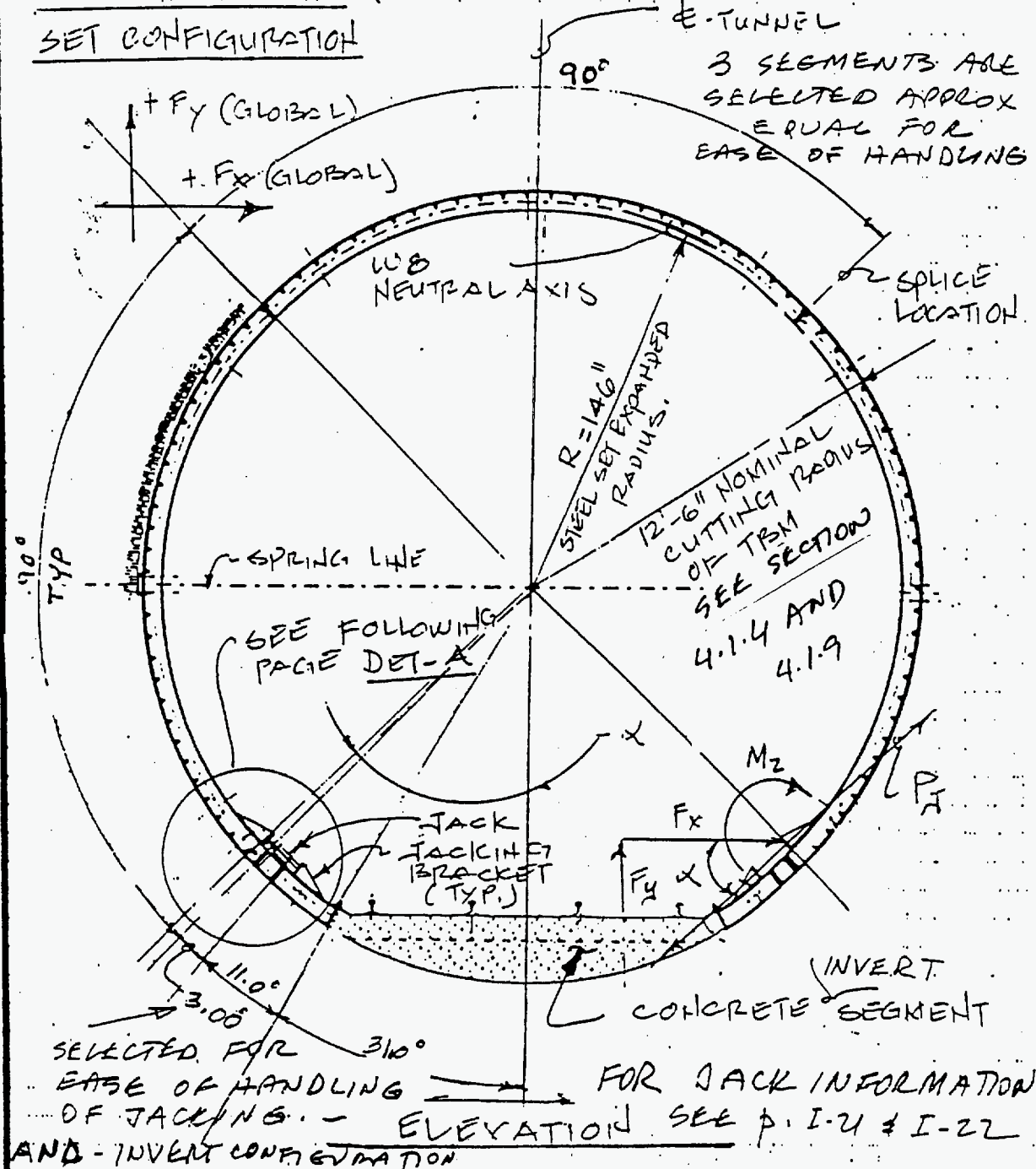
The transition from the initial horizontal contact points below the spring line at each 4 nodes to the full engagement of the steel set by the rock, will occur during the jacking process as the steel set moves upward into the excavated profile of the tunnel and additional supports are provided by the rock. As the steel set is brought in contact with more points of the excavated profile's walls and crown, additional horizontal and vertical supports between the steel sets and the rock will be engaged above the spring line, further restraining the movement of the steel set. No vertical supports are provided below the spring line due to the fact that the steel set is moving upward during the jacking operation and only supports above the spring line can restrain this vertical movement. (For supports layouts see page I-2) and individual computer inputs). In the final stage, additional intermediate points make contact, providing full or almost

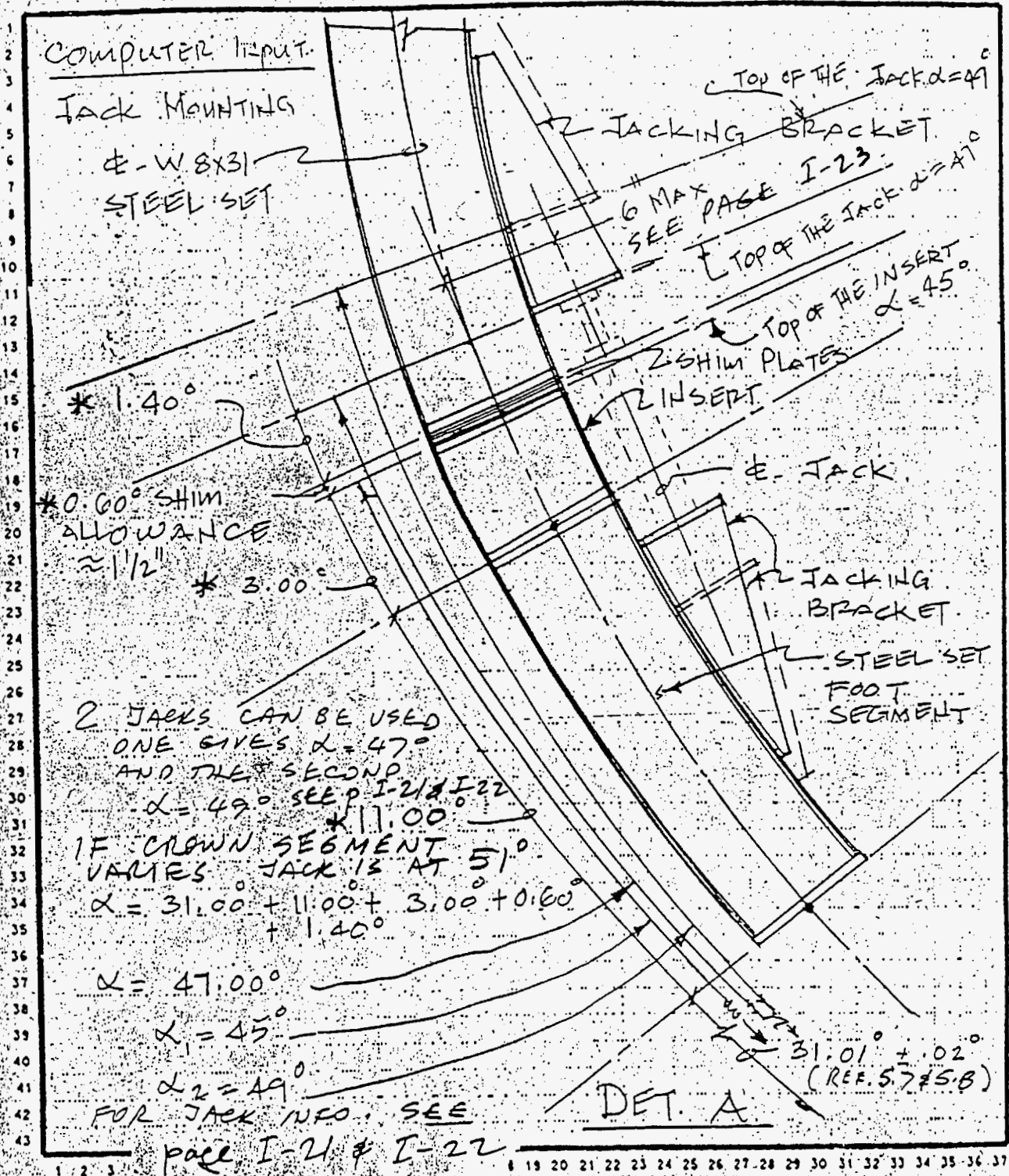
full support.

After the jacking process is completed, as described in the above paragraph, long term rock loads begin to act on the steel set . This condition is analyzed in attachment II of this analysis.

Hand calculations are performed in Attachment III based on the maximum member forces from this attachment and Attachment II.

SKETCH OF STEEL (FOR CONSTRUCTION LOADS ONLY) SET CONFIGURATION





FOR PARAMETERS MARKED *
SEE SECTION 4.1.4 FOR DISCUSSION

COMPUTER INPUT

FOR THE COMPUTER MODEL OF THE STEEL SET
USE 8 EQUAL LENGTH MEMBERS FROM
THE CONCRETE INVERT TO THE SPRING LINE.

THIS RELATES TO A MEMBER LENGTH OF
18.79 INCHES (SEE BELOW).

ARC LENGTH OF THE SEGMENT BEAM FROM
THE SPRING LINE TO THE CONCRETE INVERT
EQUALS:

$$\text{ARC LENGTH} = \frac{\pi R A}{180} = \frac{3.14(146)(90-3)}{180} \\ = 150.34 \text{ INCHES}$$

$$\text{MEMBER LENGTH} = \frac{150.34}{8} = 18.79 \text{ INCHES}$$

FOR THE COMPUTER MODEL USE 14 MEMBERS
FROM THE SPRING LINE TO THE CROWN OF THE
STEEL SET. THIS RELATES TO A MEMBER
LENGTH OF 16.38 INCHES (SEE BELOW)

ARC LENGTH OF THE SEGMENT FROM THE SPRING
LINE TO THE CROWN EQUALS,

$$\text{ARC LENGTH} = \frac{\pi R A}{180} = 229.34 \text{ INCHES}$$

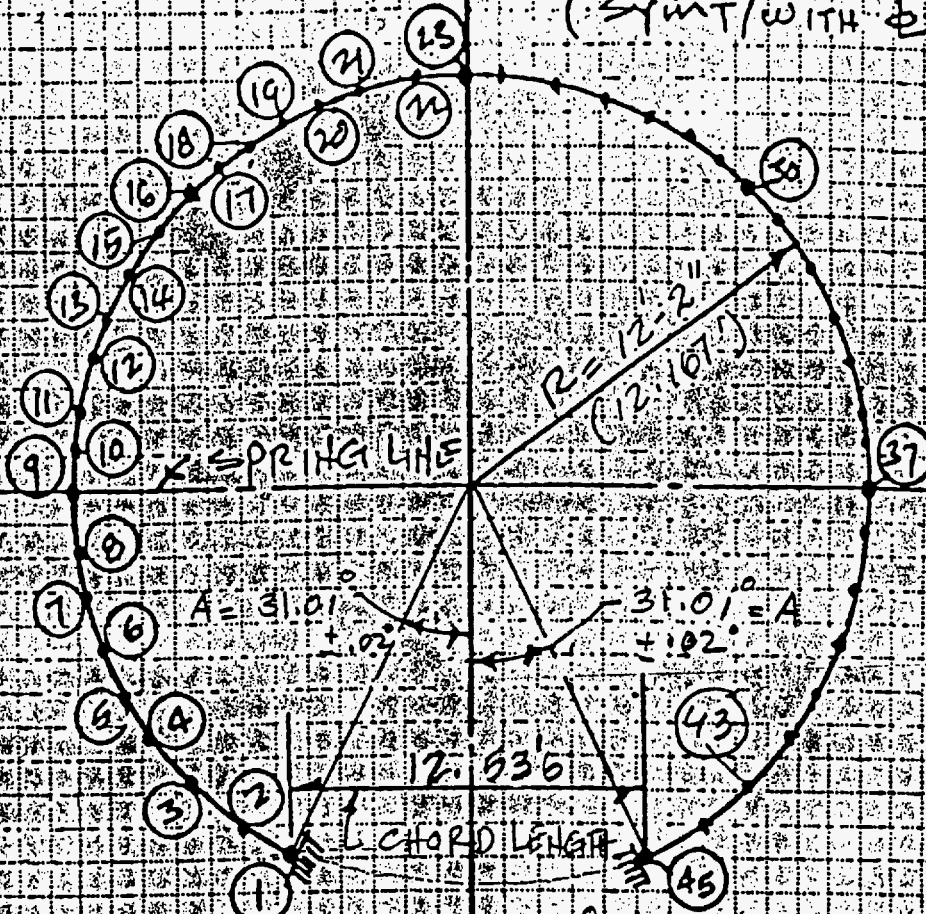
$$\text{MEMBER LENGTH} = 229.34 / 14 = 16.38 \text{ INCHES}$$

THIS WILL PROVIDE A REASONABLE COMPUTER
MODEL MEMBER LENGTH FOR A STRUCTURAL
ANALYSIS OF THE STEEL SET.

COMPUTER INPUT (FOR CONSTRUCTION AND ROCK LENGTH
TERRAIN LOADS)

(10) - NODE NUMBER

42 - TBM TUNNEL
(SYMT WITH ϕ)



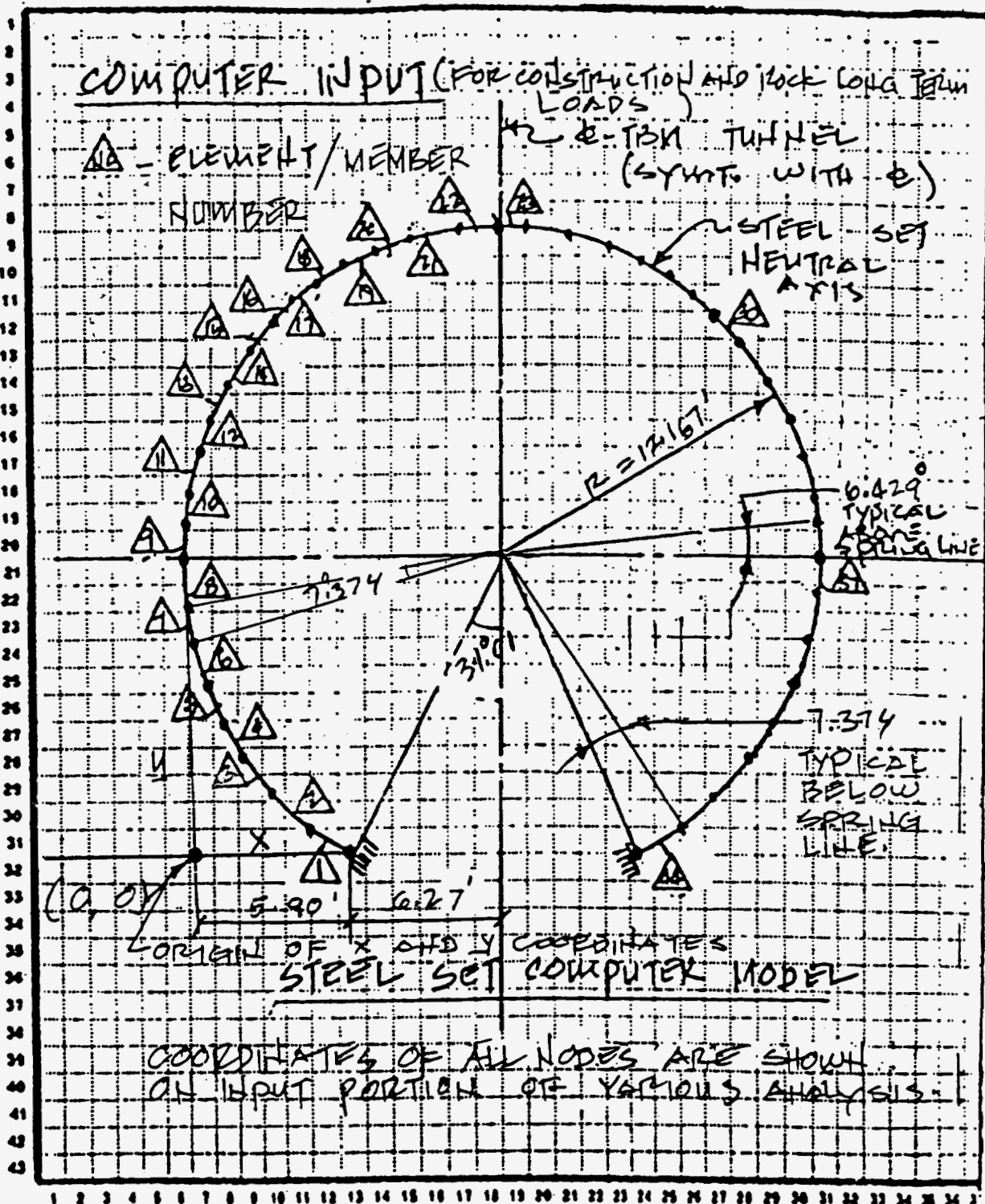
$$\text{CHORD LENGTH} = 2(R) \sin A$$

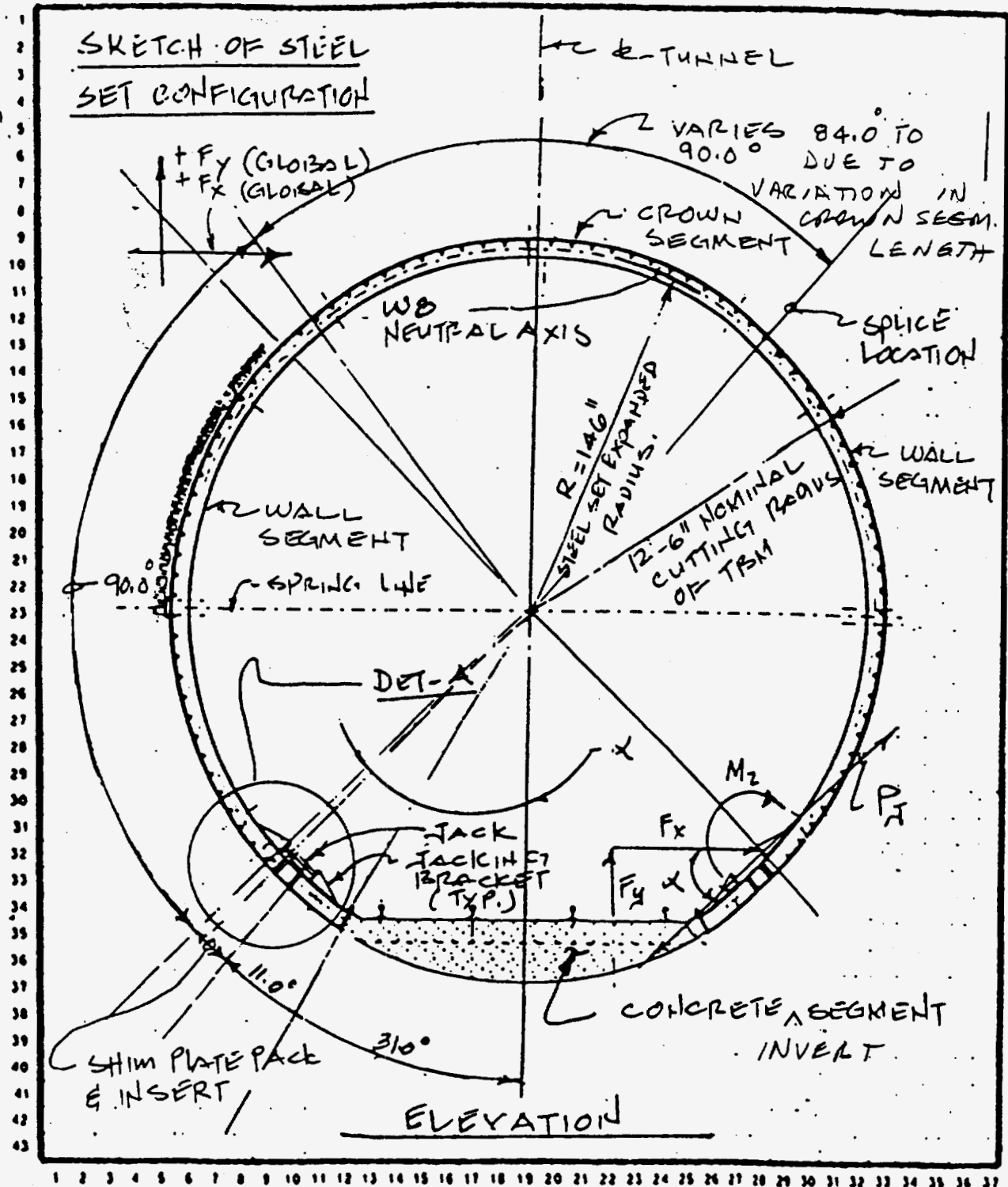
$$\text{CHORD LENGTH} = 2(12.167) \sin 31.01^\circ$$

STEEL SET COMPUTER MODEL

$$\text{CHORD LENGTH} = 12.536 \text{ FT}$$

COORDINATES OF ALL NODES ARE GENERATED
FROM THIS MODEL





JACKING FORCELOCATION. PJ ALSO
= 50' 33" P_J = JACKING FORCE $P_J = 25^T \text{ \& } 20^T$

STEEL SET 2

WALL SEGMENT

 α = JACKING ANGLE

$$\alpha = 31.0^\circ + 11.0^\circ + 9.0^\circ$$

$$\alpha = 51.0^\circ (\text{MAX.})$$

VARIES 3.60°
TO 6.00° VARIES 6.00°
TO 9.00° IF $P_J = 25^T$

$$F_x = 25^T (2^{KT}) \cos 51.0^\circ = 31.47^K$$

$$F_y = 25^T (2^{KT}) \sin 51.0^\circ = 38.86^K$$

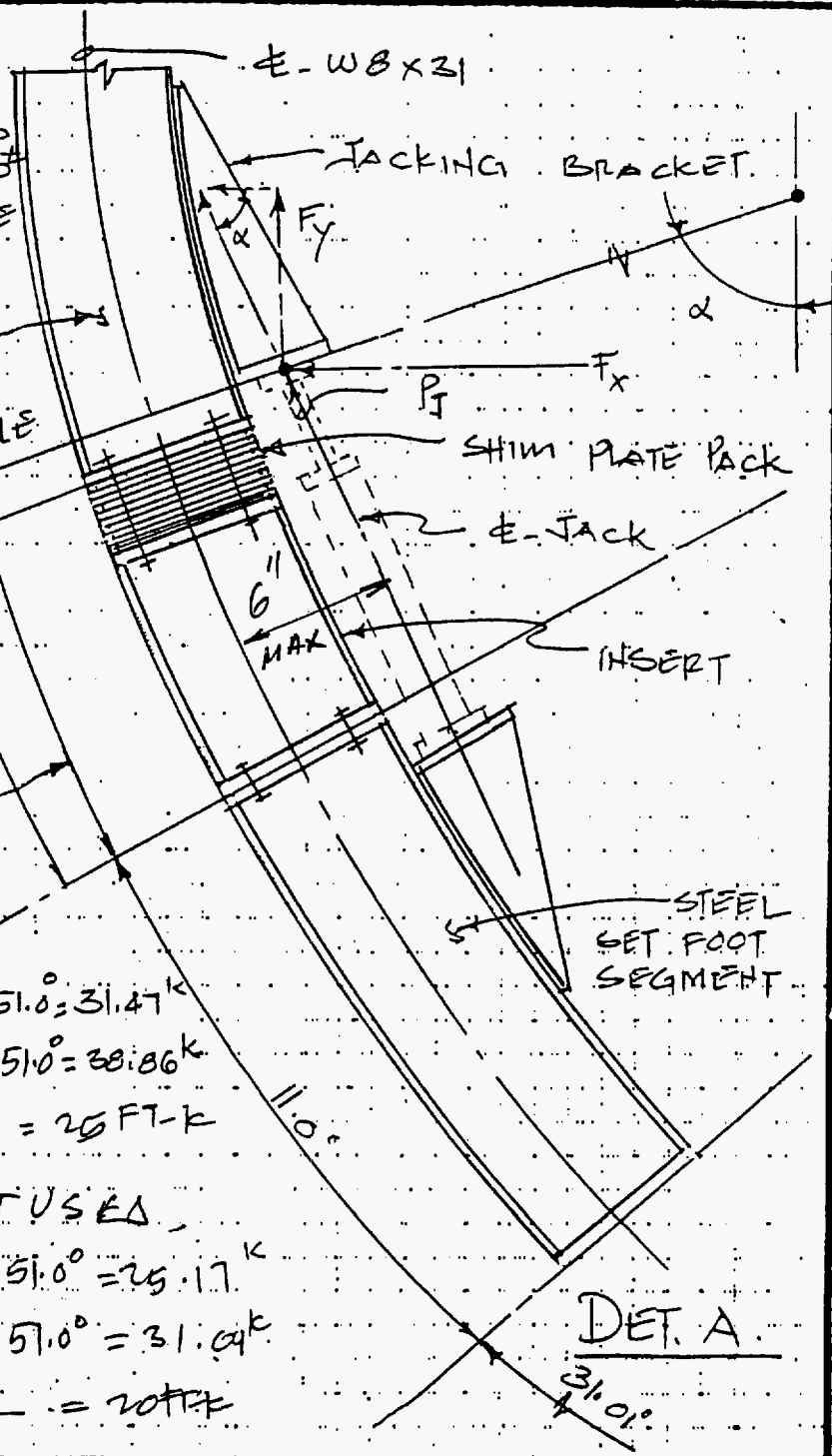
$$M_I = \frac{25^T (2^{KT}) (6")}{12"/FT} = 25 \text{ FT-K}$$

(IF $P_J = 20^T$) - NOT USED

$$F_x = 20^T (2^{KT}) \cos 51.0^\circ = 25.17^K$$

$$F_y = 20^T (2^{KT}) \sin 51.0^\circ = 31.04^K$$

$$M_I = \frac{20^T (2^{KT}) (6")}{12"/FT} = 20 \text{ FT-K}$$



DET. A

31.0°

COMPUTER INPUT THE X AND Y COORDINATES ARE
GENERATED FROM THE INFORMATION
PRESENTED ON THE MODELS

UNIT FT

JOINT COORDINATES

	X	Y		X	Y
1	5.90	0.00	16	3.56	19.03
2	4.61	0.89	17	4.58	19.94
3	3.45	1.94	18	5.69	20.73
4	2.43	3.13	19	6.89	21.39
5	1.58	4.44	20	8.15	21.91
6	0.90	5.85	21	9.46	22.29
7	0.40	7.33	22	10.80	22.52
8	0.10	8.87	23	12.17	22.60
9	0.00	10.43	24	13.53	22.52
10	0.08	11.79	25	14.87	22.29
11	0.31	13.14	26	16.18	21.91
12	0.68	14.45	27	17.45	21.39
13	1.21	15.71	28	18.64	20.73
14	1.86	16.90	29	19.75	19.94
15	2.65	18.02	30	20.77	19.03

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37

COMPUTER INPUT

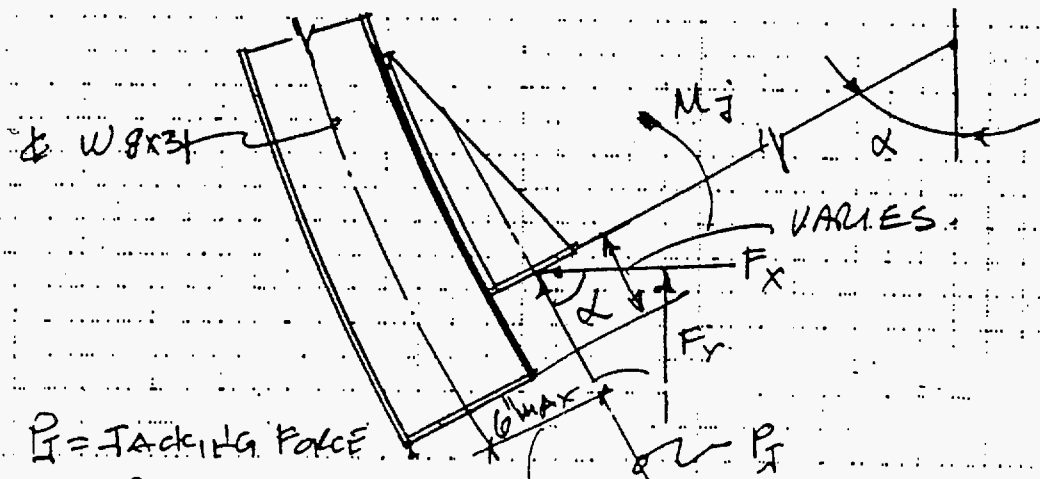
JOINT COORDINATES

	X	Y
31	21.68	18.02
32	22.47	16.90
33	23.13	15.71
34	23.65	14.45
35	24.03	13.14
36	24.26	11.79
37	24.33	10.43
38	24.23	8.87
39	23.93	7.33
40	23.44	5.85
41	22.76	4.44
42	21.90	3.13
43	20.88	1.94
44	19.72	0.89
45	18.43	0.00

COMPUTER INPUT

CONSTRUCTION LOAD - JACKING PROCESS WITH VARIOUS JACKING CAPACITY

ANALYSE W8x31 FOR JACKING

 $P_j = \text{JACKING FORCE}$

$$F_x = (P_j) \cos \alpha$$

$$F_y = (P_j) \sin \alpha$$

$$M_j = \text{JACKING MOMENT} = P_j (6'')$$

SEE P I 21 & I-22 FOR JACK INFO

COMPUTER INPUT (FOR JACKING LOADS ONLY)
 50 TONS, 30 TONS AND 25 TONS SIMULTANEOUS JACKING
 FOR: $\alpha = 47.00^\circ$
 $F_y = P_j \sin \alpha$, M_j = MOMENT FROM JACKING FORCE
 $F_x = P_j \cos \alpha$

CONVERT TON TO KIP 1 TON = 2 KIP

FOR 50 TONS JACK $M_j = \frac{50^T (2) (6)}{12"/1} = 50.0 \text{ FT-K}$

FOR 30 TONS JACK $M_j = \frac{30^T (2) (6)}{12"/1} = 30.0 \text{ FT-K}$

FOR 25 TONS JACK $M_j = \frac{25^T (2) (6)}{12"/1} = 25.0 \text{ FT-K}$

50 TONS JACK

$F_y = 50(2) \sin 47.00^\circ = 73.14 \text{ K}$

$F_x = 50(2) \cos 47.00^\circ = 68.20 \text{ K}$

30 TONS JACK

$F_y = 30(2) \sin 47.00^\circ = 43.88 \text{ K}$

$F_x = 30(2) \cos 47.00^\circ = 40.92 \text{ K}$

25 TONS JACK

$F_y = 25(2) \sin 47.00^\circ = 36.57 \text{ K}$

$F_x = 25(2) \cos 47.00^\circ = 34.10 \text{ K}$

COMPUTER INPUT FOR $\alpha = 49^\circ$

$$\alpha = 49.00^\circ$$

$$F_y = P \sin \alpha$$

$$P_x = P \cos \alpha$$

50 TONS JACK

$$F_y = 50 (2) \sin 49.00^\circ = 75.47^k$$

$$F_x = 50 (2) \cos 49.00^\circ = 65.61^k$$

30 TONS JACK

$$F_y = 30 (2) \sin 49.00^\circ = 45.28^k$$

$$F_x = 30 (2) \cos 49.00^\circ = 39.36^k$$

25 TONS JACK

$$F_y = 25 (2) \sin 49.00^\circ = 37.74^k$$

$$F_x = 25 (2) \cos 49.00^\circ = 32.80$$

20 TONS JACK - NOT USED -

$$M_I = \frac{20^T (2) \left(\frac{6}{12}\right)}{1} = 20 \text{ FT-K}$$

$$F_y = 20 (2) \sin 49.00^\circ = 30.19^k$$

$$F_x = 20 (2) \cos 49.00^\circ = 26.24^k$$

FOR COMPUTER INPUT MEMBER SELFWEIGHT
WILL BE INCREASED BY 2.5, TO ACCOUNT
FOR LAGGING - SEE NEXT PAGE

CALCULATE LAGGING WEIGHT TRIBUTARY TO STEEL SET ~

STEEL SET SPACING = 4'-0" ±

$$CB \times 11.5 = 11.5 \text{ PLF} \times 4 = 46 \text{ lb} \quad \text{SPACING: } 12'0" = 69.0$$

$$1\frac{1}{2}" \phi \text{ PIPE SPACER} = 2.7 \text{ PLF} \times 4 = 10.8 \text{ lb} \times 1/7.43 = 1.45$$

$$TIE ROD (3/4" \phi) = 1.5 \text{ PLF} \times 4 = 6.0 \text{ lb} \times 1/7.43 = 0.81$$

$$TOTAL WT = 71.3 \text{ lb}$$

$$\frac{TOTAL WT.}{STEEL SET DEAD LOAD} = \frac{71.3}{31} = 2.3$$

(USE OF FACTOR 2.5 IN COMPUTER INPUT FOR SELFWEIGHT)

- FOR LAGGING THERE IS NO SPACING

- FOR TIE ROD SPACING SEE PAGE IX - 6

COMPUTER INPUT FOR $\alpha = 51^\circ$.

$$F_y = 25(2) \sin 51^\circ = 38.86 \text{ K}$$

$$F_x = 25(2) \cos 51^\circ = 31.47 \text{ K}$$

DETERMINE POINT OF APPLICATION
OF JACKING LOAD FOR ANGLES OF
APPLICATION AT 47° , 49° AND 51°

THE POINT OF APPLICATION WILL ALWAYS
BE AT JOINTS 3 OR 43 AS APPLICABLE
SO: WE WILL VARY THE COORDINATES
OF ITS 3/43 FOR DIFFERENT ANGLES
OF APPLICATION -

$$47^\circ \quad X = -\sin 47^\circ * 146'' + 146'' = 39.2236''$$

$$= -106.77764 + 146 = 3.22' \quad \text{SEE PI-200}$$

$$Y = -\cos 47^\circ * 146'' + 146'' - 20.8667'' =$$

$$= -99.57176 + 146 - 20.8667 = 2.13'$$

$$\text{JOINT 3} \quad \begin{cases} X = 3.22' \\ Y = 2.13' \end{cases}$$

$$\text{JOINT 43} \quad \begin{cases} X = \sin 47^\circ * 146'' + 146'' = 21.06' \\ Y = 2.13' \end{cases}$$

$$\underline{49^\circ} \quad X = -\sin 49^\circ * 146'' + 146'' = 35.8126''$$

$$= \underline{2.98'}$$

$$Y = -\cos 49^\circ * 146'' * 146'' - 20.8667''$$

$$= \underline{29.3487''} = \underline{2.45'}$$

IT 3 $\left\{ \begin{array}{l} X = \underline{2.98'} \\ Y = \underline{2.45'} \end{array} \right.$

IT 43 $\left\{ \begin{array}{l} X = \sin 49^\circ * 146'' + 146'' = \underline{21.35'} \\ Y = \underline{2.45'} \end{array} \right.$

51^\circ - IT 3: $X = -\sin 51^\circ * 146'' + 146'' = \underline{2.71'}$

$$Y = -\cos 51^\circ * 146'' + 146'' - 20.8667'' = \underline{2.77'}$$

(SEE NEXT PAGE)

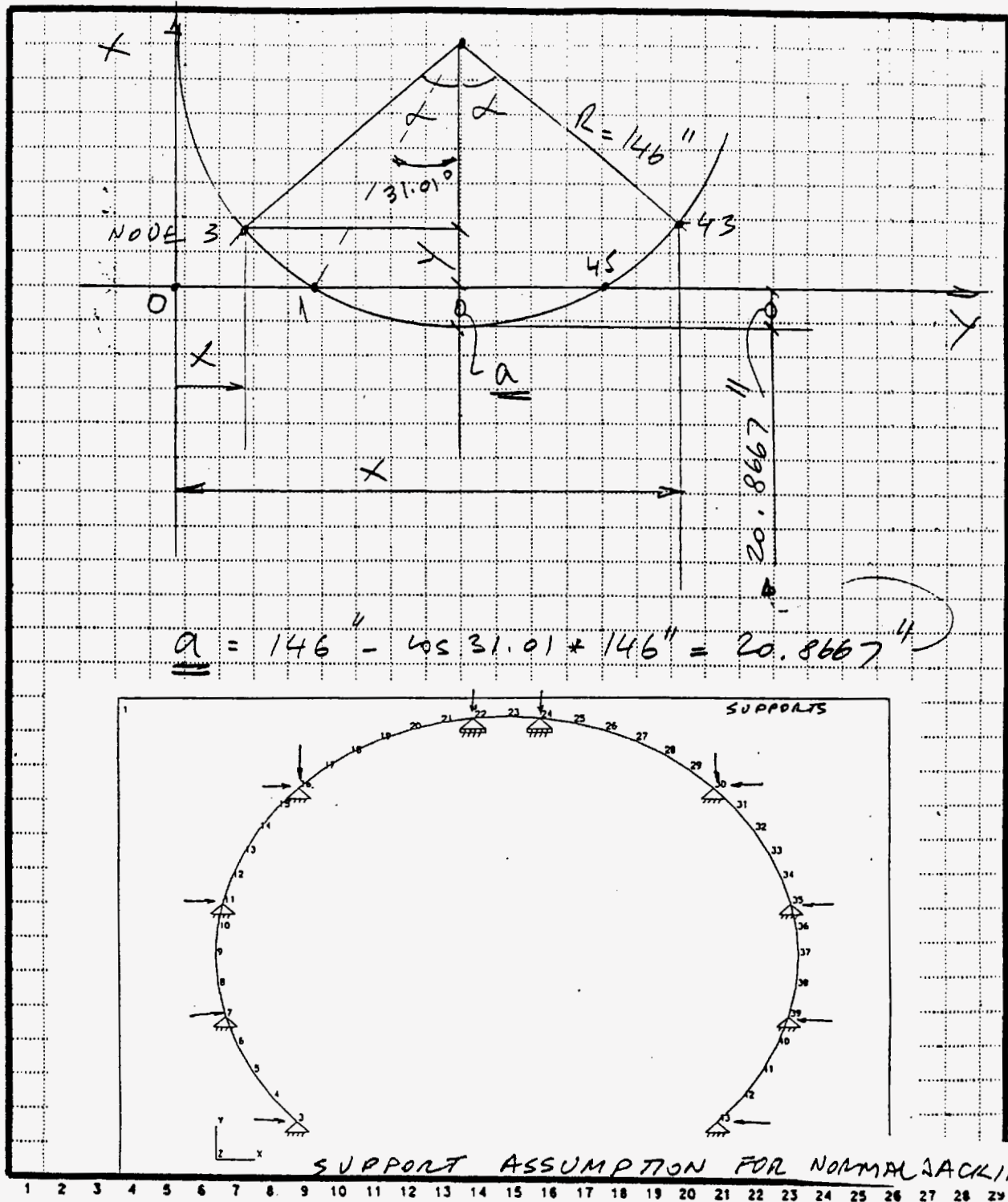
IT 43: $X = \sin 51^\circ * 146'' + 146'' = 113.46'' + 146''$

$$= 259.46'' = \underline{21.62'}$$

$$Y = \underline{2.77'}$$

$\left\{ \begin{array}{l} X = 21.62' \\ Y = 2.77' \end{array} \right.$ (ON BOTH SIDES) FOR JACKS APPLIED

FOR JACK APPLIED ON ONE SIDE - AT IT 3
COORDINATES FOR IT'S 43, 44, 45 NEED NOT CHANGE
ALL ANGLES ARE MEASURED FROM THE
VERTICAL AXIS TOWARDS THE NODE
SEE NEXT PAGE



DETERMINE JACK CHARACTERISTICS FOR
COMPUTER INPUT - ATTACHMENT VI pg. VI-3

FROM DISCUSSIONS WITH CONTRACTOR, JACKS
HSR 25BT and HSR 2510T ARE CHOSEN
AS A CLOSE REPRESENTATION OF THE JACKS
THAT WOULD ACTUALLY BE PROCURED AND
USED. APPROXIMATE DIMENSIONS:

	CLOSED	HEIGHT + STROKE = TOTAL
JACK.		
HSR-25BT	12"	+ 8" = 20"
HSR-2510T	14"	+ 10" = 24"

FOR BOTH JACKS THE BODY DIAMETER IS 3"

ESTABLISH JACK POSITION

FIRST POSITION IS AT 47° WITH VERTICAL AXIS
IF HSR-25BT IS USED - SEE pg I-7. - FOR
CALCULATION.

IF HSR-2510T IS USED.
THERE IS A MAXIMUM DIFFERENCE OF
 $24" - 20" = 4"$

FOR 1° THE ARC LENGTH = $\frac{\pi \times 146"}{360^\circ} = 2.55"$
AT E OF STEEL SET

$4" \div 2.55" / \text{DEGREE} = 1.57^\circ = 2^\circ$

HENCE CONSIDER THE SECOND POSITION AT 49°

IN CASE THE GROWN SEGMENT ^{variation} IS
VARIED FROM 90° TO 84°

$$90^\circ - 84^\circ = 6^\circ - \text{variation}$$

$$6^\circ \div 2 = 3^\circ \text{ on each side}$$

$$47^\circ + 3^\circ = 50^\circ$$

$$49^\circ + 3^\circ = 52^\circ$$

CHECK ADEQUACY OF STEEL SET
FOR 51° - WHICH WILL GIVE
CLOSE RESULTS FOR BOTH CASES.

DISTANCE BETWEEN ϕ STEEL
SET AND ϕ JACK.

$$\text{JACK BODY} = \underline{3''} - \text{SEE ATTACHMENT II - PAGE II-3 -}$$

$$3'' \div 2 = 1\frac{1}{2}''$$

$$\text{ADD: } 4'' (\frac{1}{2} \text{ W8} \times 31) + 1\frac{1}{2}'' = 5\frac{1}{2}''$$

SEE ATTACHMENT IX page IX-8.

HENCE KEEP JACK AT MAX $6''$

ϕ STEEL SET TO ϕ JACK - ($\frac{1}{2}$ TOLERANCE)


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*****
*
*           S T A A D - III
*           Revision 16.0b
*           Proprietary Program of
*           RESEARCH ENGINEERS, Inc.
*           Date=       JUL 17, 1995
*           Time=       16:12:22
*
*****

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2. STAAD PLANE BABEE0000-01717-0200-00003 ATTACHMENT I
3. * ESF GROUND SUPPORT-STRUCTURAL STEEL ANALYSIS REV 00
4. * 50 T, 30 T AND 25 T JACKING LOADS APPLIED TO BOTH SIDES OF STEEL SET
5. * AT 47 DEGREES.           FILE STLRV2
6. UNIT FT KIP
7. JOINT COORDINATES
8. 3 3.27 2.13 ; 4 2.43 3.13
9. 5 1.58 4.44 ; 6 0.90 5.85 ; 7 0.40 7.33 ; 8 0.10 8.87
10. 9 0.0 10.43 ; 10 0.08 11.79 ; 11 0.31 13.14 ; 12 0.68 14.45
11. 13 1.21 15.71 ; 14 1.86 16.90 ; 15 2.65 18.02 ; 16 3.56 19.03
12. 17 4.58 19.94 ; 18 5.69 20.73 ; 19 6.89 21.39 ; 20 8.15 21.91
13. 21 9.46 22.29 ; 22 10.80 22.52 ; 23 12.17 22.60 ; 24 13.53 22.52
14. 25 14.87 22.29 ; 26 16.18 21.91 ; 27 17.45 21.39 ; 28 18.64 20.73
15. 29 19.75 19.94 ; 30 20.77 19.03 ; 31 21.68 18.02 ; 32 22.47 16.90
16. 33 23.13 15.71 ; 34 23.65 14.45 ; 35 24.03 13.14 ; 36 24.26 11.79
17. 37 24.33 10.43 ; 38 24.23 8.87 ; 39 23.93 7.33 ; 40 23.44 5.85
18. 41 22.76 4.44 ; 42 21.90 3.13 ; 43 21.06 2.13
19. MEMBER INCIDENCE
20. 3 3 4 42
21. UNIT KIP INCH
22. MEMBER PROPERTIES
23. 3 TO 42 TA STA W8X31
24. CONSTANTS
25. E 29000.0 ALL
26. DENSITY 0.00028 ALL
27. BETA 0 ALL
28. UNIT FT
29. SUPPORT
30. 3 7 11 35 39 43 FIXED BUT FY MZ
31. 22 24 FIXED BUT FX MZ
32. 16 30 PINNED
33. UNIT KIP
34. LOAD 1
35. SELF WEIGHT Y -1.0
36. LOADING 2
37. * 50 TON JACKS AT EACH SIDE
38. JOINT LOADING
39. 3 FY 73.14
40. 43 FY 73.14
41. 3 FX -68.20
42. 43 FX 68.20
43. 43 MZ -50.00
44. 3 MZ 50.00
45. LOADING 3
45. * 30 TON JACKS AT EACH SIDE
46. JOINT LOADING
47. 3 FY 43.88

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48. 43 FY 43.88
49. 3 FX -40.92
50. 43 FX 40.92
51. 43 MZ -30.00
52. 3 MZ 30.00
53. LOADING 4
54. * 25 TON JACKS AT EACH SIDE
55. JOINT LOADING
56. 3 FX -34.10
57. 43 FX 34.10
58. 3 FY 36.57
59. 43 FY 36.57
60. 43 MZ -25.00
61. 3 MZ 25.00
62. LOADING COMBINATION 5
63. 1 2.5 2 1.0
64. LOADING COMBINATION 6
65. 1 2.5 3 1.0
66. LOADING COMBINATION 7
67. 1 2.5 4 1.0
68. PERFORM ANALYSIS

P R O B L E M S T A T I S T I C S

NUMBER OF JOINTS/MEMBER+ELEMENTS/SUPPORTS = 41/ 40/ 10
ORIGINAL/FINAL BAND-WIDTH = 1/ 1
TOTAL PRIMARY LOAD CASES = 4, TOTAL DEGREES OF FREEDOM = 111
SIZE OF STIFFNESS MATRIX = 666 DOUBLE PREC. WORDS
TOTAL REQUIRED DISK SPACE = 0.08 MEGA-BYTES

++ PROCESSING ELEMENT STIFFNESS MATRIX. 15:55:54
++ PROCESSING GLOBAL STIFFNESS MATRIX. 15:55:55
++ PROCESSING TRIANGULAR FACTORIZATION. 15:55:55
++ CALCULATING JOINT DISPLACEMENTS. 15:55:55
++ CALCULATING MEMBER FORCES. 15:55:56

69. LOAD LIST 5 6 7
70. PRINT ANALYSIS RESULTS

ATTACHMENT I

DI: BABEE0000-01717-0200-00003 REV 02

Title: ESF Ground Support - Structural Steel Analysis

Page: I - 26 of I-174

JOINT DISPLACEMENT (INCH RADIANS)

STRUCTURE TYPE = PLANE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
3	5	0.00000	0.13013	0.00000	0.00000	0.00000	0.00680
	6	0.00000	0.07763	0.00000	0.00000	0.00000	0.00409
	7	0.00000	0.06451	0.00000	0.00000	0.00000	0.00341
4	5	-0.06137	0.07148	0.00000	0.00000	0.00000	0.00369
	6	-0.03686	0.04241	0.00000	0.00000	0.00000	0.00222
	7	-0.03074	0.03515	0.00000	0.00000	0.00000	0.00185
5	5	-0.08369	0.04927	0.00000	0.00000	0.00000	0.00015
	6	-0.05027	0.02908	0.00000	0.00000	0.00000	0.00009
	7	-0.04192	0.02404	0.00000	0.00000	0.00000	0.00008
6	5	-0.05310	0.05695	0.00000	0.00000	0.00000	-0.00198
	6	-0.03189	0.03371	0.00000	0.00000	0.00000	-0.00119
	7	-0.02660	0.02790	0.00000	0.00000	0.00000	-0.00099
7	5	0.00000	0.06840	0.00000	0.00000	0.00000	-0.00145
	6	0.00000	0.04060	0.00000	0.00000	0.00000	-0.00087
	7	0.00000	0.03366	0.00000	0.00000	0.00000	-0.00073
8	5	0.00462	0.06415	0.00000	0.00000	0.00000	-0.00012
	6	0.00281	0.03808	0.00000	0.00000	0.00000	-0.00007
	7	0.00235	0.03156	0.00000	0.00000	0.00000	-0.00006
9	5	0.00113	0.05880	0.00000	0.00000	0.00000	0.00008
	6	0.00071	0.03488	0.00000	0.00000	0.00000	0.00005
	7	0.00060	0.02891	0.00000	0.00000	0.00000	0.00004
10	5	0.00120	0.05432	0.00000	0.00000	0.00000	0.00012
	6	0.00072	0.03221	0.00000	0.00000	0.00000	0.00007
	7	0.00060	0.02669	0.00000	0.00000	0.00000	0.00006
11	5	0.00000	0.05003	0.00000	0.00000	0.00000	0.00077
	6	0.00000	0.02966	0.00000	0.00000	0.00000	0.00046
	7	0.00000	0.02457	0.00000	0.00000	0.00000	0.00038
12	5	-0.02698	0.05250	0.00000	0.00000	0.00000	0.00111
	6	-0.01598	0.03112	0.00000	0.00000	0.00000	0.00065
	7	-0.01323	0.02577	0.00000	0.00000	0.00000	0.00054
13	5	-0.04444	0.05435	0.00000	0.00000	0.00000	0.00030
	6	-0.02631	0.03220	0.00000	0.00000	0.00000	0.00018
	7	-0.02178	0.02666	0.00000	0.00000	0.00000	0.00015
14	5	-0.04286	0.04773	0.00000	0.00000	0.00000	-0.00088
	6	-0.02538	0.02827	0.00000	0.00000	0.00000	-0.00052
	7	-0.02101	0.02341	0.00000	0.00000	0.00000	-0.00043
15	5	-0.02384	0.02810	0.00000	0.00000	0.00000	-0.00171
	6	-0.01412	0.01665	0.00000	0.00000	0.00000	-0.00101
	7	-0.01169	0.01378	0.00000	0.00000	0.00000	-0.00084
16	5	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00139
	6	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00082
	7	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00068
17	5	0.00772	-0.00961	0.00000	0.00000	0.00000	-0.00050
	6	0.00461	-0.00576	0.00000	0.00000	0.00000	-0.00030
	7	0.00383	-0.00480	0.00000	0.00000	0.00000	-0.00025
18	5	0.00809	-0.01129	0.00000	0.00000	0.00000	0.00000
	6	0.00486	-0.00682	0.00000	0.00000	0.00000	0.00000
	7	0.00406	-0.00571	0.00000	0.00000	0.00000	0.00000

JOINT DISPLACEMENT (INCH RADIANS)

STRUCTURE TYPE = PLANE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
19	5	0.00578	-0.00852	0.00000	0.00000	0.00000	0.00021
	6	0.00351	-0.00522	0.00000	0.00000	0.00000	0.00013
	7	0.00294	-0.00440	0.00000	0.00000	0.00000	0.00010
20	5	0.00335	-0.00447	0.00000	0.00000	0.00000	0.00023
	6	0.00205	-0.00281	0.00000	0.00000	0.00000	0.00014
	7	0.00172	-0.00240	0.00000	0.00000	0.00000	0.00012
21	5	0.00170	-0.00134	0.00000	0.00000	0.00000	0.00015
	6	0.00104	-0.00088	0.00000	0.00000	0.00000	0.00009
	7	0.00088	-0.00077	0.00000	0.00000	0.00000	0.00008
22	5	0.00076	0.00000	0.00000	0.00000	0.00000	0.00008
	6	0.00046	0.00000	0.00000	0.00000	0.00000	0.00005
	7	0.00039	0.00000	0.00000	0.00000	0.00000	0.00004
23	5	0.00001	0.00094	0.00000	0.00000	0.00000	0.00000
	6	0.00001	0.00058	0.00000	0.00000	0.00000	0.00000
	7	0.00000	0.00048	0.00000	0.00000	0.00000	0.00000
24	5	-0.00074	0.00000	0.00000	0.00000	0.00000	-0.00008
	6	-0.00045	0.00000	0.00000	0.00000	0.00000	-0.00005
	7	-0.00037	0.00000	0.00000	0.00000	0.00000	-0.00004
25	5	-0.00168	-0.00132	0.00000	0.00000	0.00000	-0.00015
	6	-0.00103	-0.00088	0.00000	0.00000	0.00000	-0.00009
	7	-0.00087	-0.00076	0.00000	0.00000	0.00000	-0.00008
26	5	-0.00332	-0.00444	0.00000	0.00000	0.00000	-0.00023
	6	-0.00203	-0.00279	0.00000	0.00000	0.00000	-0.00014
	7	-0.00171	-0.00238	0.00000	0.00000	0.00000	-0.00012
27	5	-0.00574	-0.00848	0.00000	0.00000	0.00000	-0.00021
	6	-0.00348	-0.00520	0.00000	0.00000	0.00000	-0.00013
	7	-0.00292	-0.00438	0.00000	0.00000	0.00000	-0.00010
28	5	-0.00805	-0.01124	0.00000	0.00000	0.00000	0.00000
	6	-0.00484	-0.00680	0.00000	0.00000	0.00000	0.00000
	7	-0.00404	-0.00568	0.00000	0.00000	0.00000	0.00000
29	5	-0.00770	-0.00959	0.00000	0.00000	0.00000	0.00050
	6	-0.00460	-0.00575	0.00000	0.00000	0.00000	0.00030
	7	-0.00382	-0.00479	0.00000	0.00000	0.00000	0.00025
30	5	0.00000	0.00000	0.00000	0.00000	0.00000	0.00138
	6	0.00000	0.00000	0.00000	0.00000	0.00000	0.00082
	7	0.00000	0.00000	0.00000	0.00000	0.00000	0.00068
31	5	0.02379	0.02807	0.00000	0.00000	0.00000	0.00171
	6	0.01409	0.01662	0.00000	0.00000	0.00000	0.00101
	7	0.01167	0.01377	0.00000	0.00000	0.00000	0.00084
32	5	0.04283	0.04770	0.00000	0.00000	0.00000	0.00089
	6	0.02536	0.02825	0.00000	0.00000	0.00000	0.00053
	7	0.02099	0.02339	0.00000	0.00000	0.00000	0.00044
33	5	0.04463	0.05450	0.00000	0.00000	0.00000	-0.00030
	6	0.02642	0.03229	0.00000	0.00000	0.00000	-0.00018
	7	0.02188	0.02674	0.00000	0.00000	0.00000	-0.00015
34	5	0.02678	0.05260	0.00000	0.00000	0.00000	-0.00111
	6	0.01586	0.03117	0.00000	0.00000	0.00000	-0.00066
	7	0.01313	0.02582	0.00000	0.00000	0.00000	-0.00054

JOINT DISPLACEMENT (INCH RADIANS)

STRUCTURE TYPE = PLANE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
35	5	0.00000	0.05001	0.00000	0.00000	0.00000	-0.00077
	6	0.00000	0.02965	0.00000	0.00000	0.00000	-0.00046
	7	0.00000	0.02456	0.00000	0.00000	0.00000	-0.00038
36	5	-0.00130	0.05429	0.00000	0.00000	0.00000	-0.00014
	6	-0.00078	0.03219	0.00000	0.00000	0.00000	-0.00008
	7	-0.00065	0.02668	0.00000	0.00000	0.00000	-0.00007
37	5	-0.00170	0.05874	0.00000	0.00000	0.00000	-0.00009
	6	-0.00105	0.03484	0.00000	0.00000	0.00000	-0.00006
	7	-0.00089	0.02888	0.00000	0.00000	0.00000	-0.00005
38	5	-0.00513	0.06409	0.00000	0.00000	0.00000	0.00013
	6	-0.00311	0.03804	0.00000	0.00000	0.00000	0.00008
	7	-0.00261	0.03153	0.00000	0.00000	0.00000	0.00007
39	5	0.00000	0.06824	0.00000	0.00000	0.00000	0.00149
	6	0.00000	0.04051	0.00000	0.00000	0.00000	0.00090
	7	0.00000	0.03358	0.00000	0.00000	0.00000	0.00075
40	5	0.05403	0.05680	0.00000	0.00000	0.00000	0.00201
	6	0.03245	0.03362	0.00000	0.00000	0.00000	0.00121
	7	0.02706	0.02783	0.00000	0.00000	0.00000	0.00101
41	5	0.08481	0.04903	0.00000	0.00000	0.00000	-0.00016
	6	0.05094	0.02894	0.00000	0.00000	0.00000	-0.00010
	7	0.04247	0.02392	0.00000	0.00000	0.00000	-0.00008
42	5	0.06185	0.07189	0.00000	0.00000	0.00000	-0.00373
	6	0.03715	0.04265	0.00000	0.00000	0.00000	-0.00224
	7	0.03097	0.03535	0.00000	0.00000	0.00000	-0.00187
43	5	0.00000	0.13094	0.00000	0.00000	0.00000	-0.00685
	6	0.00000	0.07812	0.00000	0.00000	0.00000	-0.00411
	7	0.00000	0.06492	0.00000	0.00000	0.00000	-0.00343

SUPPORT REACTIONS -UNIT KIP FEET

STRUCTURE TYPE = PLANE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
3	5	12.46	0.00	0.00	0.00	0.00	0.00
	6	7.52	0.00	0.00	0.00	0.00	0.00
	7	6.28	0.00	0.00	0.00	0.00	0.00
7	5	56.73	0.00	0.00	0.00	0.00	0.00
	6	34.02	0.00	0.00	0.00	0.00	0.00
	7	28.34	0.00	0.00	0.00	0.00	0.00
11	5	38.74	0.00	0.00	0.00	0.00	0.00
	6	22.96	0.00	0.00	0.00	0.00	0.00
	7	19.01	0.00	0.00	0.00	0.00	0.00
35	5	-38.86	0.00	0.00	0.00	0.00	0.00
	6	-23.03	0.00	0.00	0.00	0.00	0.00
	7	-19.07	0.00	0.00	0.00	0.00	0.00
39	5	-56.75	0.00	0.00	0.00	0.00	0.00
	6	-34.03	0.00	0.00	0.00	0.00	0.00
	7	-28.35	0.00	0.00	0.00	0.00	0.00
43	5	-12.40	0.00	0.00	0.00	0.00	0.00
	6	-7.49	0.00	0.00	0.00	0.00	0.00
	7	-6.25	0.00	0.00	0.00	0.00	0.00
22	5	0.00	-2.38	0.00	0.00	0.00	0.00
	6	0.00	-1.32	0.00	0.00	0.00	0.00
	7	0.00	-1.05	0.00	0.00	0.00	0.00
24	5	0.00	-2.39	0.00	0.00	0.00	0.00
	6	0.00	-1.33	0.00	0.00	0.00	0.00
	7	0.00	-1.06	0.00	0.00	0.00	0.00
16	5	-28.58	-68.59	0.00	0.00	0.00	0.00
	6	-16.82	-40.39	0.00	0.00	0.00	0.00
	7	-13.88	-33.35	0.00	0.00	0.00	0.00
30	5	28.66	-68.59	0.00	0.00	0.00	0.00
	6	16.87	-40.39	0.00	0.00	0.00	0.00
	7	13.92	-33.35	0.00	0.00	0.00	0.00

MEMBER END FORCES STRUCTURE TYPE = PLANE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
3	5	3	91.86	4.36	0.00	0.00	0.00	-50.00
		4	-91.78	-4.30	0.00	0.00	0.00	55.65
	6	3	55.08	2.65	0.00	0.00	0.00	-30.00
		4	-55.00	-2.58	0.00	0.00	0.00	33.42
	7	3	45.89	2.22	0.00	0.00	0.00	-25.00
		4	-45.82	-2.16	0.00	0.00	0.00	27.86
4	5	4	91.61	-7.00	0.00	0.00	0.00	-55.65
		5	-91.51	7.07	0.00	0.00	0.00	44.67
	6	4	54.91	-4.19	0.00	0.00	0.00	-33.42
		5	-54.81	4.25	0.00	0.00	0.00	26.83
	7	4	45.74	-3.48	0.00	0.00	0.00	-27.86
		5	-45.63	3.55	0.00	0.00	0.00	22.37
5	5	5	89.89	-18.53	0.00	0.00	0.00	-44.67
		6	-89.79	18.58	0.00	0.00	0.00	15.61
	6	5	53.83	-11.12	0.00	0.00	0.00	-26.83
		6	-53.73	11.17	0.00	0.00	0.00	9.38
	7	5	44.83	-9.27	0.00	0.00	0.00	-22.37
		6	-44.72	9.32	0.00	0.00	0.00	7.82
6	5	6	86.81	-29.51	0.00	0.00	0.00	-15.61
		7	-86.70	29.55	0.00	0.00	0.00	-30.51
	6	6	51.94	-17.71	0.00	0.00	0.00	-9.38
		7	-51.83	17.75	0.00	0.00	0.00	-18.31
	7	6	43.23	-14.76	0.00	0.00	0.00	-7.82
		7	-43.11	14.80	0.00	0.00	0.00	-15.26
7	5	7	71.15	14.87	0.00	0.00	0.00	30.51
		8	-71.03	-14.85	0.00	0.00	0.00	-7.20
	6	7	42.50	8.91	0.00	0.00	0.00	18.31
		8	-42.38	-8.89	0.00	0.00	0.00	-4.35
	7	7	35.34	7.42	0.00	0.00	0.00	15.26
		8	-35.23	-7.40	0.00	0.00	0.00	-3.64
8	5	8	72.35	5.63	0.00	0.00	0.00	7.20
		9	-72.23	-5.62	0.00	0.00	0.00	1.59
	6	8	43.17	3.39	0.00	0.00	0.00	4.35
		9	-43.05	-3.38	0.00	0.00	0.00	0.94
	7	8	35.88	2.83	0.00	0.00	0.00	3.64
		9	-35.76	-2.82	0.00	0.00	0.00	0.77
9	5	9	72.37	3.27	0.00	0.00	0.00	1.59
		10	-72.27	-3.26	0.00	0.00	0.00	2.86
	6	9	43.14	1.92	0.00	0.00	0.00	0.94
		10	-43.04	-1.91	0.00	0.00	0.00	1.67
	7	9	35.84	1.58	0.00	0.00	0.00	0.77
		10	-35.73	-1.58	0.00	0.00	0.00	1.38

MEMBER END FORCES STRUCTURE TYPE = PLANE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
10	5	10	71.47	11.17	0.00	0.00	0.00	-2.86
		11	-71.37	-11.16	0.00	0.00	0.00	18.15
	6	10	42.57	6.63	0.00	0.00	0.00	-1.67
		11	-42.46	-6.61	0.00	0.00	0.00	10.74
	7	10	35.35	5.49	0.00	0.00	0.00	-1.38
		11	-35.24	-5.47	0.00	0.00	0.00	8.88
11	5	11	80.31	-18.60	0.00	0.00	0.00	-18.15
		12	-80.21	18.63	0.00	0.00	0.00	-7.19
	6	11	47.76	-11.01	0.00	0.00	0.00	-10.74
		12	-47.66	11.04	0.00	0.00	0.00	-4.27
	7	11	39.63	-9.11	0.00	0.00	0.00	-8.88
		12	-39.53	9.14	0.00	0.00	0.00	-3.54
12	5	12	81.89	-8.65	0.00	0.00	0.00	7.19
		13	-81.79	8.70	0.00	0.00	0.00	-19.05
	6	12	48.65	-5.11	0.00	0.00	0.00	4.27
		13	-48.56	5.15	0.00	0.00	0.00	-11.28
	7	12	40.35	-4.22	0.00	0.00	0.00	3.54
		13	-40.25	4.26	0.00	0.00	0.00	-9.34
13	5	13	82.25	-0.34	0.00	0.00	0.00	19.05
		14	-82.16	0.39	0.00	0.00	0.00	-19.55
	6	13	48.83	-0.19	0.00	0.00	0.00	11.28
		14	-48.74	0.24	0.00	0.00	0.00	-11.57
	7	13	40.48	-0.15	0.00	0.00	0.00	9.34
		14	-40.39	0.20	0.00	0.00	0.00	-9.58
14	5	14	81.67	8.99	0.00	0.00	0.00	19.55
		15	-81.58	-8.93	0.00	0.00	0.00	-7.27
	6	14	48.45	5.32	0.00	0.00	0.00	11.57
		15	-48.36	-5.26	0.00	0.00	0.00	-4.32
	7	14	40.15	4.41	0.00	0.00	0.00	9.58
		15	-40.06	-4.35	0.00	0.00	0.00	-3.58
15	5	15	79.94	18.55	0.00	0.00	0.00	7.27
		16	-79.87	-18.48	0.00	0.00	0.00	17.91
	6	15	47.39	10.97	0.00	0.00	0.00	4.32
		16	-47.32	-10.90	0.00	0.00	0.00	10.55
	7	15	39.26	9.07	0.00	0.00	0.00	3.58
		16	-39.18	-9.00	0.00	0.00	0.00	8.71
16	5	16	10.40	-5.10	0.00	0.00	0.00	-17.91
		17	-10.33	5.18	0.00	0.00	0.00	10.89
	6	16	6.41	-2.97	0.00	0.00	0.00	-10.55
		17	-6.34	3.04	0.00	0.00	0.00	6.44
	7	16	5.41	-2.43	0.00	0.00	0.00	-8.71
		17	-5.35	2.51	0.00	0.00	0.00	5.33
17	5	17	10.83	-4.01	0.00	0.00	0.00	-10.89
		18	-10.77	4.10	0.00	0.00	0.00	5.36

MEMBER END FORCES

STRUCTURE TYPE = PLANE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	6	17	6.64	-2.33	0.00	0.00	0.00	-6.44
		18	-6.58	2.42	0.00	0.00	0.00	3.21
	7	17	5.59	-1.91	0.00	0.00	0.00	-5.33
		18	-5.53	1.99	0.00	0.00	0.00	2.67
18	5	18	11.17	-2.83	0.00	0.00	0.00	-5.36
		19	-11.12	2.92	0.00	0.00	0.00	1.43
	6	18	6.81	-1.64	0.00	0.00	0.00	-3.21
		19	-6.76	1.73	0.00	0.00	0.00	0.90
	7	18	5.72	-1.34	0.00	0.00	0.00	-2.67
		19	-5.67	1.44	0.00	0.00	0.00	0.76
19	5	19	11.38	-1.66	0.00	0.00	0.00	-1.43
		20	-11.34	1.76	0.00	0.00	0.00	-0.90
	6	19	6.91	-0.97	0.00	0.00	0.00	-0.90
		20	-6.87	1.07	0.00	0.00	0.00	-0.49
	7	19	5.79	-0.80	0.00	0.00	0.00	-0.76
		20	-5.75	0.89	0.00	0.00	0.00	-0.39
20	5	20	11.46	-0.51	0.00	0.00	0.00	0.90
		21	-11.43	0.61	0.00	0.00	0.00	-1.67
	6	20	6.95	-0.31	0.00	0.00	0.00	0.49
		21	-6.92	0.41	0.00	0.00	0.00	-0.98
	7	20	5.82	-0.26	0.00	0.00	0.00	0.39
		21	-5.79	0.36	0.00	0.00	0.00	-0.81
21	5	21	11.43	0.67	0.00	0.00	0.00	1.67
		22	-11.41	-0.57	0.00	0.00	0.00	-0.83
	6	21	6.92	0.37	0.00	0.00	0.00	0.98
		22	-6.90	-0.26	0.00	0.00	0.00	-0.56
	7	21	5.79	0.29	0.00	0.00	0.00	0.81
		22	-5.78	-0.19	0.00	0.00	0.00	-0.49
22	5	22	11.14	-0.54	0.00	0.00	0.00	0.83
		23	-11.13	0.65	0.00	0.00	0.00	-1.64
	6	22	6.75	-0.29	0.00	0.00	0.00	0.56
		23	-6.75	0.39	0.00	0.00	0.00	-1.02
	7	22	5.66	-0.22	0.00	0.00	0.00	0.49
		23	-5.65	0.33	0.00	0.00	0.00	-0.86
23	5	23	11.13	0.66	0.00	0.00	0.00	1.64
		24	-11.14	-0.55	0.00	0.00	0.00	-0.82
	6	23	6.75	0.40	0.00	0.00	0.00	1.02
		24	-6.75	-0.29	0.00	0.00	0.00	-0.55
	7	23	5.65	0.33	0.00	0.00	0.00	0.86
		24	-5.66	-0.23	0.00	0.00	0.00	-0.48
24	5	24	11.41	-0.57	0.00	0.00	0.00	0.82
		25	-11.43	0.67	0.00	0.00	0.00	-1.66
	6	24	6.90	-0.27	0.00	0.00	0.00	0.55
		25	-6.92	0.37	0.00	0.00	0.00	-0.98

MEMBER END FORCES STRUCTURE TYPE = PLANE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	7	24	5.78	-0.19	0.00	0.00	0.00	0.48
		25	-5.79	0.29	0.00	0.00	0.00	-0.81
25	5	25	11.43	0.61	0.00	0.00	0.00	1.66
		26	-11.46	-0.51	0.00	0.00	0.00	-0.90
	6	25	6.92	0.41	0.00	0.00	0.00	0.98
		26	-6.95	-0.31	0.00	0.00	0.00	-0.49
	7	25	5.79	0.36	0.00	0.00	0.00	0.81
		26	-5.82	-0.26	0.00	0.00	0.00	-0.38
26	5	26	11.34	1.72	0.00	0.00	0.00	0.90
		27	-11.38	-1.63	0.00	0.00	0.00	1.40
	6	26	6.87	1.05	0.00	0.00	0.00	0.49
		27	-6.91	-0.95	0.00	0.00	0.00	0.88
	7	26	5.76	0.88	0.00	0.00	0.00	0.38
		27	-5.80	-0.78	0.00	0.00	0.00	0.75
27	5	27	11.11	2.95	0.00	0.00	0.00	-1.40
		28	-11.16	-2.86	0.00	0.00	0.00	5.36
	6	27	6.76	1.75	0.00	0.00	0.00	-0.88
		28	-6.81	-1.66	0.00	0.00	0.00	3.20
	7	27	5.67	1.45	0.00	0.00	0.00	-0.75
		28	-5.72	-1.36	0.00	0.00	0.00	2.67
28	5	28	10.77	4.09	0.00	0.00	0.00	-5.36
		29	-10.83	-4.01	0.00	0.00	0.00	10.88
	6	28	6.58	2.41	0.00	0.00	0.00	-3.20
		29	-6.64	-2.33	0.00	0.00	0.00	6.43
	7	28	5.53	1.99	0.00	0.00	0.00	-2.67
		29	-5.59	-1.91	0.00	0.00	0.00	5.32
29	5	29	10.33	5.17	0.00	0.00	0.00	-10.88
		30	-10.40	-5.09	0.00	0.00	0.00	17.90
	6	29	6.34	3.04	0.00	0.00	0.00	-6.43
		30	-6.41	-2.96	0.00	0.00	0.00	10.54
	7	29	5.35	2.51	0.00	0.00	0.00	-5.32
		30	-5.42	-2.43	0.00	0.00	0.00	8.70
30	5	30	79.92	-18.42	0.00	0.00	0.00	-17.90
		31	-80.00	18.49	0.00	0.00	0.00	-7.19
	6	30	47.35	-10.86	0.00	0.00	0.00	-10.54
		31	-47.43	10.93	0.00	0.00	0.00	-4.27
	7	30	39.21	-8.97	0.00	0.00	0.00	-8.70
		31	-39.29	9.04	0.00	0.00	0.00	-3.54
31	5	31	81.63	-8.86	0.00	0.00	0.00	7.19
		32	-81.72	8.92	0.00	0.00	0.00	-19.37
	6	31	48.39	-5.22	0.00	0.00	0.00	4.27
		32	-48.48	5.28	0.00	0.00	0.00	-11.47
	7	31	40.08	-4.31	0.00	0.00	0.00	3.54
		32	-40.17	4.37	0.00	0.00	0.00	-9.50

MEMBER END FORCES STRUCTURE TYPE = PLANE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
32	5	32	82.20	-0.06	0.00	0.00	0.00	19.37
		33	-82.29	0.11	0.00	0.00	0.00	-19.50
	6	32	48.76	-0.03	0.00	0.00	0.00	11.47
		33	-48.85	0.08	0.00	0.00	0.00	-11.55
	7	32	40.41	-0.02	0.00	0.00	0.00	9.50
		33	-40.50	0.07	0.00	0.00	0.00	-9.56
33	5	33	81.76	9.33	0.00	0.00	0.00	19.50
		34	-81.86	-9.29	0.00	0.00	0.00	-6.81
	6	33	48.54	5.53	0.00	0.00	0.00	11.55
		34	-48.64	-5.49	0.00	0.00	0.00	-4.04
	7	33	40.24	4.58	0.00	0.00	0.00	9.56
		34	-40.34	-4.54	0.00	0.00	0.00	-3.35
34	5	34	80.36	18.14	0.00	0.00	0.00	6.81
		35	-80.46	-18.11	0.00	0.00	0.00	17.92
	6	34	47.75	10.75	0.00	0.00	0.00	4.04
		35	-47.85	-10.72	0.00	0.00	0.00	10.60
	7	34	39.60	8.90	0.00	0.00	0.00	3.35
		35	-39.70	-8.87	0.00	0.00	0.00	8.77
35	5	35	71.36	-11.19	0.00	0.00	0.00	-17.92
		36	-71.47	11.21	0.00	0.00	0.00	2.58
	6	35	42.46	-6.63	0.00	0.00	0.00	-10.60
		36	-42.56	6.65	0.00	0.00	0.00	1.51
	7	35	35.24	-5.49	0.00	0.00	0.00	-8.77
		36	-35.34	5.51	0.00	0.00	0.00	1.24
36	5	36	72.29	-2.77	0.00	0.00	0.00	-2.58
		37	-72.39	2.77	0.00	0.00	0.00	-1.19
	6	36	43.05	-1.62	0.00	0.00	0.00	-1.51
		37	-43.15	1.62	0.00	0.00	0.00	-0.70
	7	36	35.74	-1.33	0.00	0.00	0.00	-1.24
		37	-35.85	1.34	0.00	0.00	0.00	-0.57
37	5	37	72.23	-5.59	0.00	0.00	0.00	-1.19
		38	-72.35	5.59	0.00	0.00	0.00	-7.55
	6	37	43.05	-3.36	0.00	0.00	0.00	-0.70
		38	-43.17	3.37	0.00	0.00	0.00	-4.56
	7	37	35.76	-2.80	0.00	0.00	0.00	-0.57
		38	-35.88	2.81	0.00	0.00	0.00	-3.81
38	5	38	71.04	-14.81	0.00	0.00	0.00	7.55
		39	-71.16	14.83	0.00	0.00	0.00	-30.80
	6	38	42.39	-8.87	0.00	0.00	0.00	4.56
		39	-42.50	8.89	0.00	0.00	0.00	-18.49
	7	38	35.23	-7.38	0.00	0.00	0.00	3.81
		39	-35.35	7.40	0.00	0.00	0.00	-15.41
39	5	39	86.53	30.13	0.00	0.00	0.00	30.80
		40	-86.65	-30.09	0.00	0.00	0.00	16.13

MEMBER END FORCES STRUCTURE TYPE = PLANE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
	6	39	51.73	18.09	0.00	0.00	0.00	18.49
		40	-51.84	-18.05	0.00	0.00	0.00	9.69
	7	39	43.03	15.09	0.00	0.00	0.00	15.41
		40	-43.15	-15.05	0.00	0.00	0.00	8.08
40	5	40	89.81	18.64	0.00	0.00	0.00	-16.13
		41	-89.92	-18.58	0.00	0.00	0.00	45.26
	6	40	53.74	11.20	0.00	0.00	0.00	-9.69
		41	-53.85	-11.15	0.00	0.00	0.00	27.18
	7	40	44.73	9.34	0.00	0.00	0.00	-8.08
		41	-44.84	-9.29	0.00	0.00	0.00	22.67
41	5	41	91.58	6.63	0.00	0.00	0.00	-45.26
		42	-91.68	-6.56	0.00	0.00	0.00	55.60
	6	41	54.85	3.99	0.00	0.00	0.00	-27.18
		42	-54.95	-3.92	0.00	0.00	0.00	33.38
	7	41	45.67	3.33	0.00	0.00	0.00	-22.67
		42	-45.77	-3.26	0.00	0.00	0.00	27.83
42	5	42	91.82	-4.25	0.00	0.00	0.00	-55.60
		43	-91.89	4.32	0.00	0.00	0.00	50.00
	6	42	55.03	-2.56	0.00	0.00	0.00	-33.38
		43	-55.10	2.62	0.00	0.00	0.00	30.00
	7	42	45.84	-2.14	0.00	0.00	0.00	-27.83
		43	-45.91	2.20	0.00	0.00	0.00	25.00

***** END OF LATEST ANALYSIS RESULT *****

71. LOAD LIST 5
 72. CHECK CODE ALL

STAAD-III CODE CHECKING - (AISC)

ALL UNITS ARE - KIP FEET (UNLESS OTHERWISE NOTED)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
=====					
* 3	ST W8X 31	FAIL	AISC- H1-2	1.488	5
		91.78 C	0.00	55.65	1.31
* 4	ST W8X 31	FAIL	AISC- H1-2	1.487	5
		91.61 C	0.00	-55.65	0.00
* 5	ST W8X 31	FAIL	AISC- H1-2	1.276	5
		89.89 C	0.00	-44.67	0.00
* 6	ST W8X 31	FAIL	AISC- H1-2	1.000	5
		86.70 C	0.00	-30.51	1.56
7	ST W8X 31	PASS	AISC- H1-2	0.921	5
		71.15 C	0.00	30.51	0.00
8	ST W8X 31	PASS	AISC- H1-2	0.499	5
		72.35 C	0.00	7.20	0.00
9	ST W8X 31	PASS	AISC- H1-2	0.419	5
		72.27 C	0.00	2.86	1.36
10	ST W8X 31	PASS	AISC- H1-2	0.695	5
		71.37 C	0.00	18.15	1.37
11	ST W8X 31	PASS	AISC- H1-2	0.740	5
		80.31 C	0.00	-18.15	0.00
12	ST W8X 31	PASS	AISC- H1-2	0.765	5
		81.79 C	0.00	-19.05	1.37
13	ST W8X 31	PASS	AISC- H1-2	0.776	5
		82.16 C	0.00	-19.55	1.36
14	ST W8X 31	PASS	AISC- H1-2	0.773	5
		81.67 C	0.00	19.55	0.00
15	ST W8X 31	PASS	AISC- H1-2	0.734	5
		79.87 C	0.00	17.91	1.36
16	ST W8X 31	PASS	AISC- H1-3	0.382	5
		10.40 C	0.00	-17.91	0.00
17	ST W8X 31	PASS	AISC- H1-3	0.256	5
		10.83 C	0.00	-10.89	0.00
18	ST W8X 31	PASS	AISC- H1-3	0.156	5
		11.17 C	0.00	-5.36	0.00
19	ST W8X 31	PASS	AISC- H1-3	0.085	5
		11.38 C	0.00	-1.43	0.00
20	ST W8X 31	PASS	AISC- H1-3	0.090	5
		11.43 C	0.00	-1.67	1.36
21	ST W8X 31	PASS	AISC- H1-3	0.090	5
		11.43 C	0.00	1.67	0.00
22	ST W8X 31	PASS	AISC- H1-3	0.088	5
		11.13 C	0.00	-1.64	1.37
23	ST W8X 31	PASS	AISC- H1-3	0.088	5
		11.13 C	0.00	1.64	0.00
24	ST W8X 31	PASS	AISC- H1-3	0.089	5
		11.43 C	0.00	-1.66	1.36
25	ST W8X 31	PASS	AISC- H1-3	0.090	5
		11.43 C	0.00	1.66	0.00
26	ST W8X 31	PASS	AISC- H1-3	0.084	5
		11.38 C	0.00	1.40	1.37

ALL UNITS ARE - KIP FEET (UNLESS OTHERWISE NOTED)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
27	ST W8X 31	PASS 11.16 C	AISC- H1-3 0.00	0.156 5.36	5 1.36
28	ST W8X 31	PASS 10.83 C	AISC- H1-3 0.00	0.256 10.88	5 1.36
29	ST W8X 31	PASS 10.40 C	AISC- H1-3 0.00	0.382 17.90	5 1.37
30	ST W8X 31	PASS 79.92 C	AISC- H1-2 0.00	0.734 -17.90	5 0.00
31	ST W8X 31	PASS 81.72 C	AISC- H1-2 0.00	0.770 -19.37	5 1.37
32	ST W8X 31	PASS 82.29 C	AISC- H1-2 0.00	0.775 -19.50	5 1.36
33	ST W8X 31	PASS 81.76 C	AISC- H1-2 0.00	0.773 19.50	5 0.00
34	ST W8X 31	PASS 80.46 C	AISC- H1-2 0.00	0.737 17.92	5 1.36
35	ST W8X 31	PASS 71.36 C	AISC- H1-2 0.00	0.691 -17.92	5 0.00
36	ST W8X 31	PASS 72.29 C	AISC- H1-2 0.00	0.414 -2.58	5 0.00
37	ST W8X 31	PASS 72.35 C	AISC- H1-2 0.00	0.506 -7.55	5 1.56
38	ST W8X 31	PASS 71.16 C	AISC- H1-2 0.00	0.927 -30.80	5 1.57
* 39	ST W8X 31	FAIL 86.53 C	AISC- H1-2 0.00	1.005 30.80	5 0.00
* 40	ST W8X 31	FAIL 89.92 C	AISC- H1-2 0.00	1.287 45.26	5 1.57
* 41	ST W8X 31	FAIL 91.68 C	AISC- H1-2 0.00	1.486 55.60	5 1.57
* 42	ST W8X 31	FAIL 91.82 C	AISC- H1-2 0.00	1.487 -55.60	5 0.00

***** END OF TABULATED RESULT OF DESIGN *****

73. LOAD LIST 6

74. CHECK CODE ALL

STAAD-III CODE CHECKING - (AISC)

ALL UNITS ARE - KIP FEET (UNLESS OTHERWISE NOTED)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
3	ST W8X 31	PASS 55.00 C	AISC- H1-2 0.00	0.893 33.42	6 1.31
4	ST W8X 31	PASS 54.91 C	AISC- H1-2 0.00	0.892 -33.42	6 0.00
5	ST W8X 31	PASS 53.83 C	AISC- H1-2 0.00	0.766 -26.83	6 0.00
6	ST W8X 31	PASS 51.83 C	AISC- H1-2 0.00	0.599 -18.31	6 1.56
7	ST W8X 31	PASS 42.50 C	AISC- H1-2 0.00	0.552 18.31	6 0.00
8	ST W8X 31	PASS 43.17 C	AISC- H1-2 0.00	0.299 4.35	6 0.00
9	ST W8X 31	PASS 43.04 C	AISC- H1-2 0.00	0.249 1.67	6 1.36
10	ST W8X 31	PASS 42.46 C	AISC- H1-2 0.00	0.412 10.74	6 1.37
11	ST W8X 31	PASS 47.76 C	AISC- H1-2 0.00	0.439 -10.74	6 0.00
12	ST W8X 31	PASS 48.56 C	AISC- H1-2 0.00	0.453 -11.28	6 1.37
13	ST W8X 31	PASS 48.74 C	AISC- H1-2 0.00	0.460 -11.57	6 1.36
14	ST W8X 31	PASS 48.45 C	AISC- H1-2 0.00	0.458 11.57	6 0.00
15	ST W8X 31	PASS 47.32 C	AISC- H1-2 0.00	0.434 10.55	6 1.36
16	ST W8X 31	PASS 6.41 C	AISC- H1-3 0.00	0.227 -10.55	6 0.00
17	ST W8X 31	PASS 6.64 C	AISC- H1-3 0.00	0.152 -6.44	6 0.00
18	ST W8X 31	PASS 6.81 C	AISC- H1-3 0.00	0.094 -3.21	6 0.00
19	ST W8X 31	PASS 6.91 C	AISC- H1-3 0.00	0.052 -0.90	6 0.00
20	ST W8X 31	PASS 6.92 C	AISC- H1-3 0.00	0.054 -0.98	6 1.36
21	ST W8X 31	PASS 6.92 C	AISC- H1-3 0.00	0.054 0.98	6 0.00
22	ST W8X 31	PASS 6.75 C	AISC- H1-3 0.00	0.054 -1.02	6 1.37
23	ST W8X 31	PASS 6.75 C	AISC- H1-3 0.00	0.054 1.02	6 0.00
24	ST W8X 31	PASS 6.92 C	AISC- H1-3 0.00	0.054 -0.98	6 1.36
25	ST W8X 31	PASS 6.92 C	AISC- H1-3 0.00	0.054 0.98	6 0.00
26	ST W8X 31	PASS 6.91 C	AISC- H1-3 0.00	0.052 0.88	6 1.37

ALL UNITS ARE - KIP FEET (UNLESS OTHERWISE NOTED)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
=====					
27	ST W8X 31	PASS	AISC- H1-3	0.094	6
		6.81 C	0.00	3.20	1.36
28	ST W8X 31	PASS	AISC- H1-3	0.152	6
		6.64 C	0.00	6.43	1.36
29	ST W8X 31	PASS	AISC- H1-3	0.227	6
		6.41 C	0.00	10.54	1.37
30	ST W8X 31	PASS	AISC- H1-2	0.434	6
		47.35 C	0.00	-10.54	0.00
31	ST W8X 31	PASS	AISC- H1-2	0.456	6
		48.48 C	0.00	-11.47	1.37
32	ST W8X 31	PASS	AISC- H1-2	0.460	6
		48.85 C	0.00	-11.55	1.36
33	ST W8X 31	PASS	AISC- H1-2	0.458	6
		48.54 C	0.00	11.55	0.00
34	ST W8X 31	PASS	AISC- H1-2	0.437	6
		47.85 C	0.00	10.60	1.36
35	ST W8X 31	PASS	AISC- H1-2	0.410	6
		42.46 C	0.00	-10.60	0.00
36	ST W8X 31	PASS	AISC- H1-2	0.246	6
		43.05 C	0.00	-1.51	0.00
37	ST W8X 31	PASS	AISC- H1-2	0.303	6
		43.17 C	0.00	-4.56	1.56
38	ST W8X 31	PASS	AISC- H1-2	0.555	6
		42.50 C	0.00	-18.49	1.57
39	ST W8X 31	PASS	AISC- H1-2	0.602	6
		51.73 C	0.00	18.49	0.00
40	ST W8X 31	PASS	AISC- H1-2	0.772	6
		53.85 C	0.00	27.18	1.57
41	ST W8X 31	PASS	AISC- H1-2	0.892	6
		54.95 C	0.00	33.38	1.57
42	ST W8X 31	PASS	AISC- H1-2	0.892	6
		55.03 C	0.00	-33.38	0.00

***** END OF TABULATED RESULT OF DESIGN *****

75. LOAD LIST 7

76. CHECK CODE ALL

STAAD-III CODE CHECKING - (AISC)

ALL UNITS ARE - KIP . FEET (UNLESS OTHERWISE NOTED)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
=====					
3	ST W8X 31	PASS	AISC- H1-2	0.744	7
		45.82 C	0.00	27.86	1.31
4	ST W8X 31	PASS	AISC- H1-2	0.744	7
		45.74 C	0.00	-27.86	0.00
5	ST W8X 31	PASS	AISC- H1-2	0.638	7
		44.83 C	0.00	-22.37	0.00
6	ST W8X 31	PASS	AISC- H1-2	0.499	7
		43.11 C	0.00	-15.26	1.56
7	ST W8X 31	PASS	AISC- H1-2	0.460	7
		35.34 C	0.00	15.26	0.00
8	ST W8X 31	PASS	AISC- H1-2	0.249	7
		35.88 C	0.00	3.64	0.00
9	ST W8X 31	PASS	AISC- H1-2	0.207	7
		35.73 C	0.00	1.38	1.36
10	ST W8X 31	PASS	AISC- H1-2	0.342	7
		35.24 C	0.00	8.88	1.37
11	ST W8X 31	PASS	AISC- H1-2	0.364	7
		39.63 C	0.00	-8.88	0.00
12	ST W8X 31	PASS	AISC- H1-2	0.376	7
		40.25 C	0.00	-9.34	1.37
13	ST W8X 31	PASS	AISC- H1-2	0.381	7
		40.39 C	0.00	-9.58	1.36
14	ST W8X 31	PASS	AISC- H1-2	0.380	7
		40.15 C	0.00	9.58	0.00
15	ST W8X 31	PASS	AISC- H1-2	0.359	7
		39.18 C	0.00	8.71	1.36
16	ST W8X 31	PASS	AISC- H1-3	0.188	7
		5.41 C	0.00	-8.71	0.00
17	ST W8X 31	PASS	AISC- H1-3	0.127	7
		5.59 C	0.00	-5.33	0.00
18	ST W8X 31	PASS	AISC- H1-3	0.078	7
		5.72 C	0.00	-2.67	0.00
19	ST W8X 31	PASS	AISC- H1-3	0.044	7
		5.79 C	0.00	-0.76	0.00
20	ST W8X 31	PASS	AISC- H1-3	0.045	7
		5.79 C	0.00	-0.81	1.36
21	ST W8X 31	PASS	AISC- H1-3	0.045	7
		5.79 C	0.00	0.81	0.00
22	ST W8X 31	PASS	AISC- H1-3	0.045	7
		5.65 C	0.00	-0.86	1.37
23	ST W8X 31	PASS	AISC- H1-3	0.045	7
		5.65 C	0.00	0.86	0.00
24	ST W8X 31	PASS	AISC- H1-3	0.045	7
		5.79 C	0.00	-0.81	1.36
25	ST W8X 31	PASS	AISC- H1-3	0.045	7
		5.79 C	0.00	0.81	0.00
26	ST W8X 31	PASS	AISC- H1-3	0.044	7
		5.80 C	0.00	0.75	1.37

L UNITS ARE - KIP FEET (UNLESS OTHERWISE NOTED)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
=====					
27	ST W8X 31	PASS	AISC- H1-3	0.078	7
		5.72 C	0.00	2.67	1.36
28	ST W8X 31	PASS	AISC- H1-3	0.127	7
		5.59 C	0.00	5.32	1.36
29	ST W8X 31	PASS	AISC- H1-3	0.188	7
		5.42 C	0.00	8.70	1.37
30	ST W8X 31	PASS	AISC- H1-2	0.359	7
		39.21 C	0.00	-8.70	0.00
31	ST W8X 31	PASS	AISC- H1-2	0.378	7
		40.17 C	0.00	-9.50	1.37
32	ST W8X 31	PASS	AISC- H1-2	0.381	7
		40.50 C	0.00	-9.56	1.36
33	ST W8X 31	PASS	AISC- H1-2	0.380	7
		40.24 C	0.00	9.56	0.00
34	ST W8X 31	PASS	AISC- H1-2	0.362	7
		39.70 C	0.00	8.77	1.36
35	ST W8X 31	PASS	AISC- H1-2	0.340	7
		35.24 C	0.00	-8.77	0.00
36	ST W8X 31	PASS	AISC- H1-2	0.204	7
		35.74 C	0.00	-1.24	0.00
37	ST W8X 31	PASS	AISC- H1-2	0.252	7
		35.88 C	0.00	-3.81	1.56
38	ST W8X 31	PASS	AISC- H1-2	0.462	7
		35.35 C	0.00	-15.41	1.57
39	ST W8X 31	PASS	AISC- H1-2	0.501	7
		43.03 C	0.00	15.41	0.00
40	ST W8X 31	PASS	AISC- H1-2	0.644	7
		44.84 C	0.00	22.67	1.57
41	ST W8X 31	PASS	AISC- H1-2	0.743	7
		45.77 C	0.00	27.83	1.57
42	ST W8X 31	PASS	AISC- H1-2	0.744	7
		45.84 C	0.00	-27.83	0.00

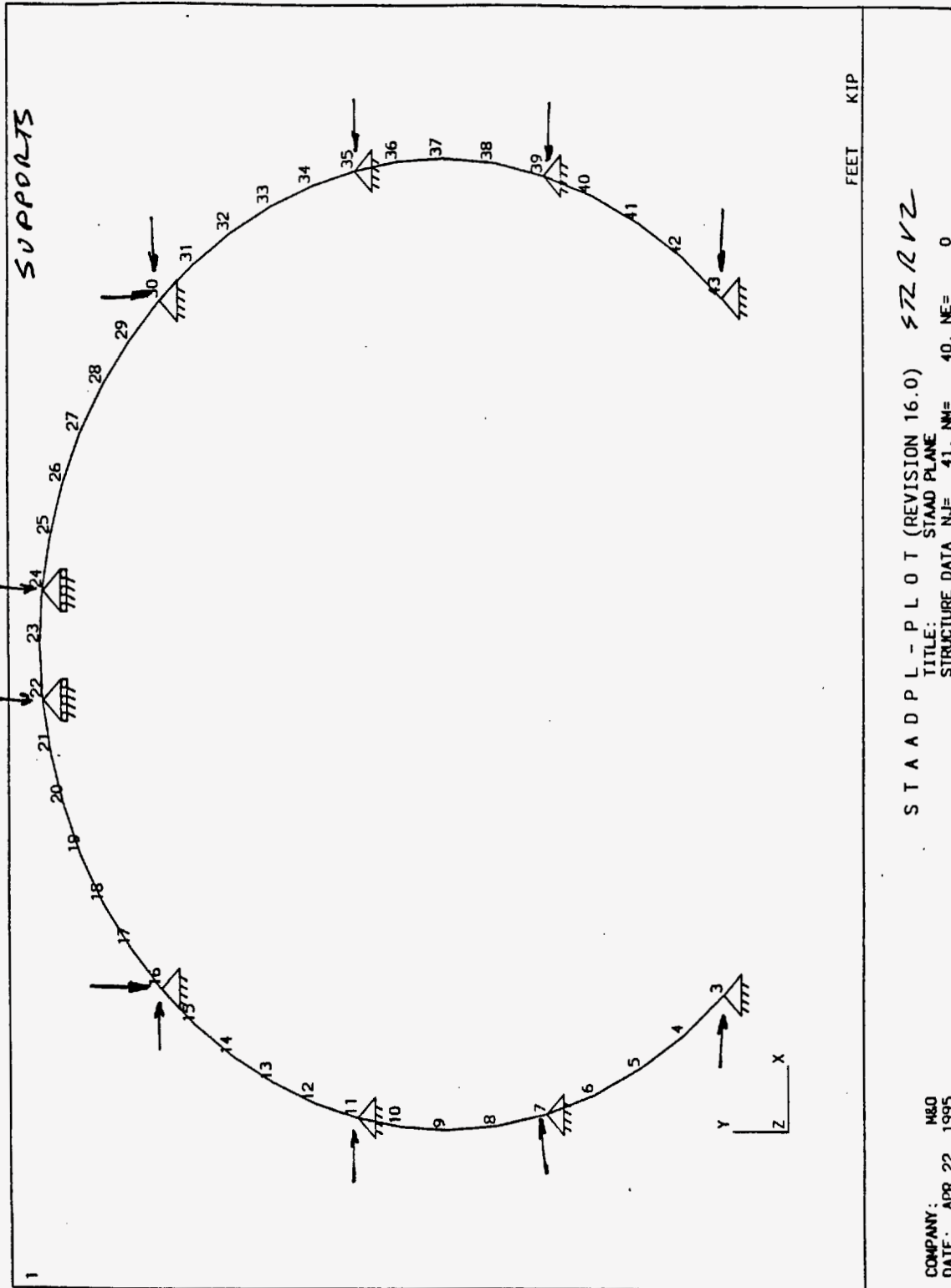
***** END OF TABULATED RESULT OF DESIGN *****

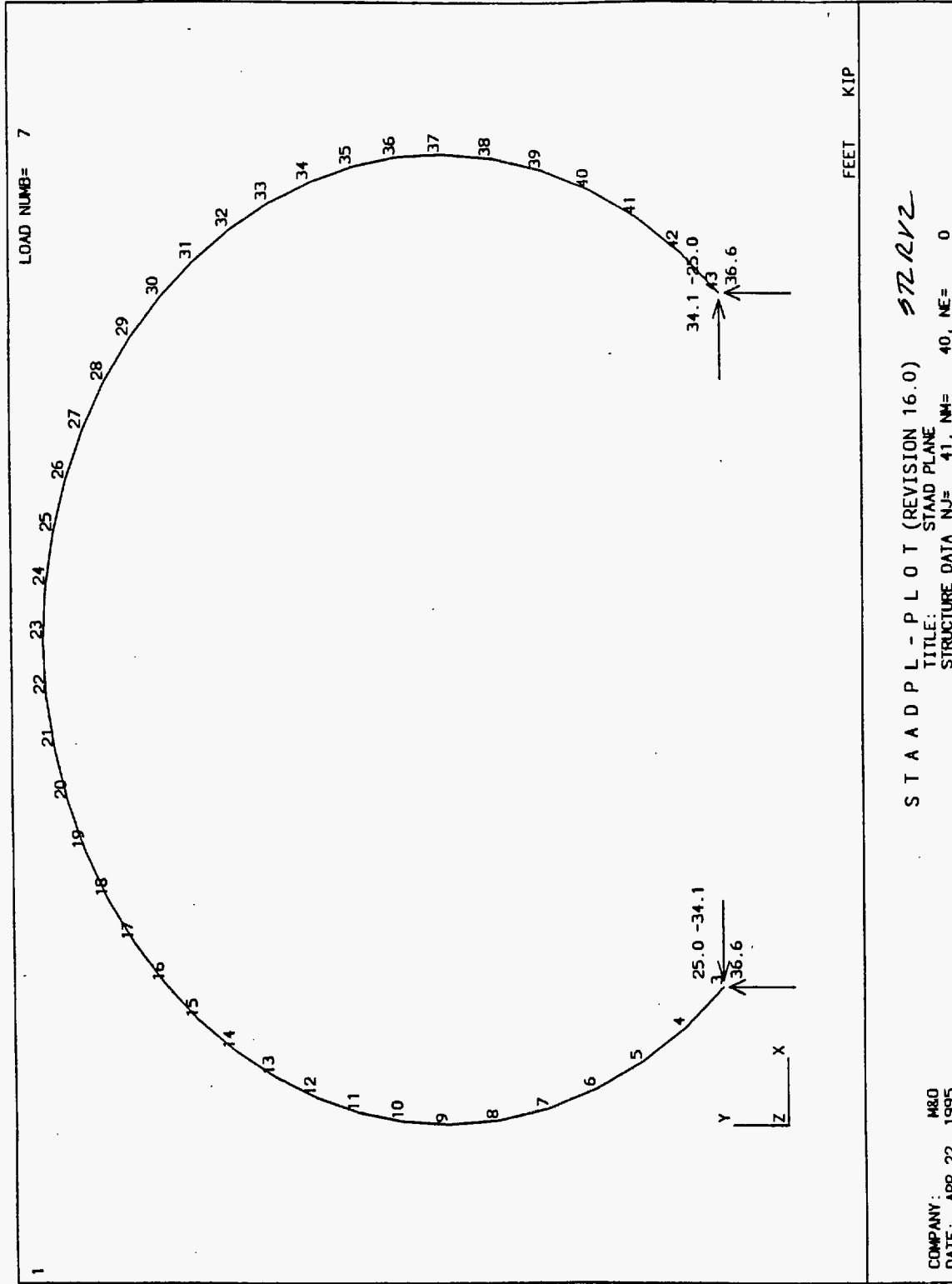
77. PLOT DISPLACEMENT FILE
 78. PLOT STRESS FILE
 79. PLOT BENDING FILE
 80. FINISH

***** END OF STAAD-III *****

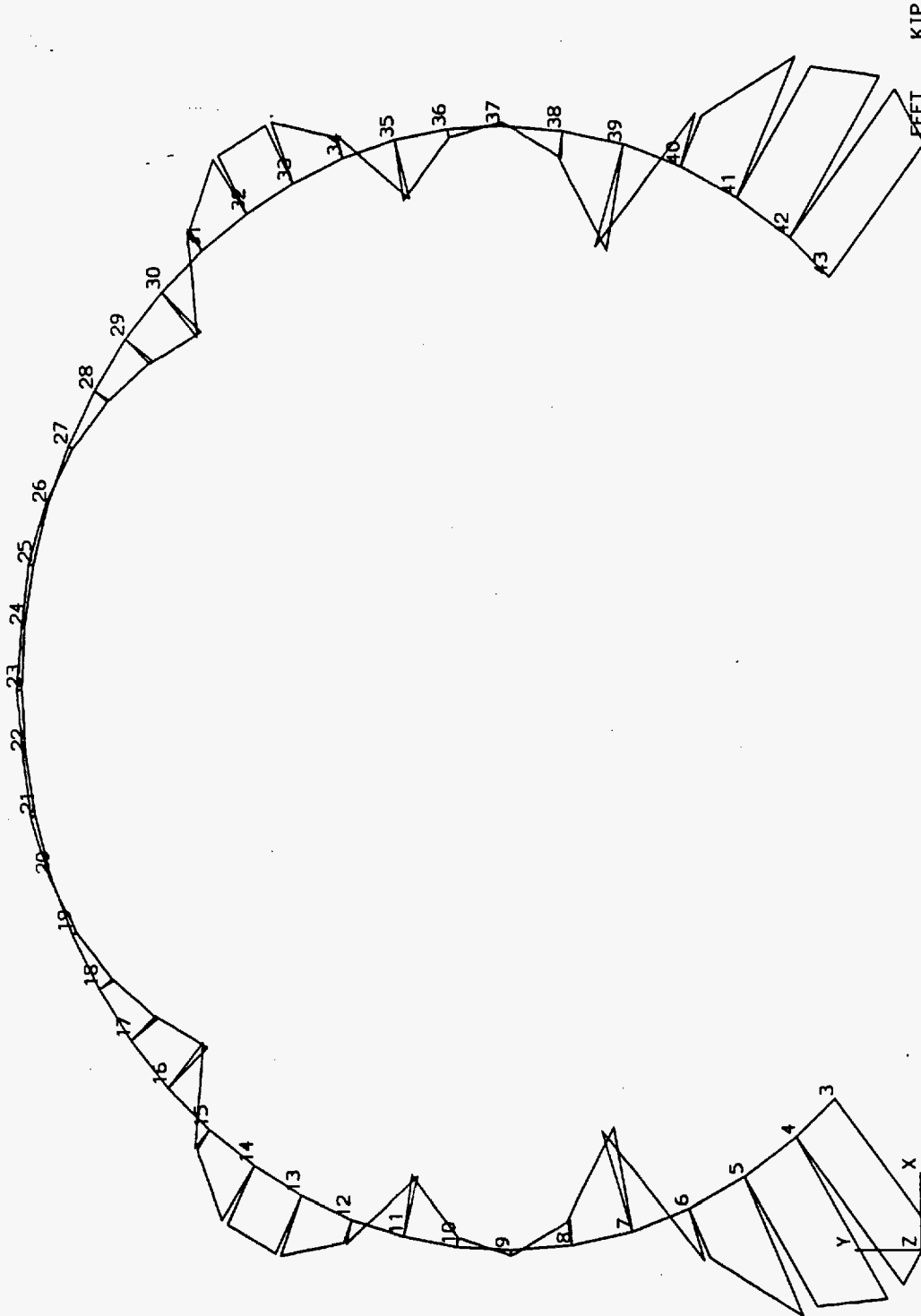
DATE= JUL 17,1995 TIME= 15:56: 2 *****

* For questions on STAAD-III/ISDS, contact: *





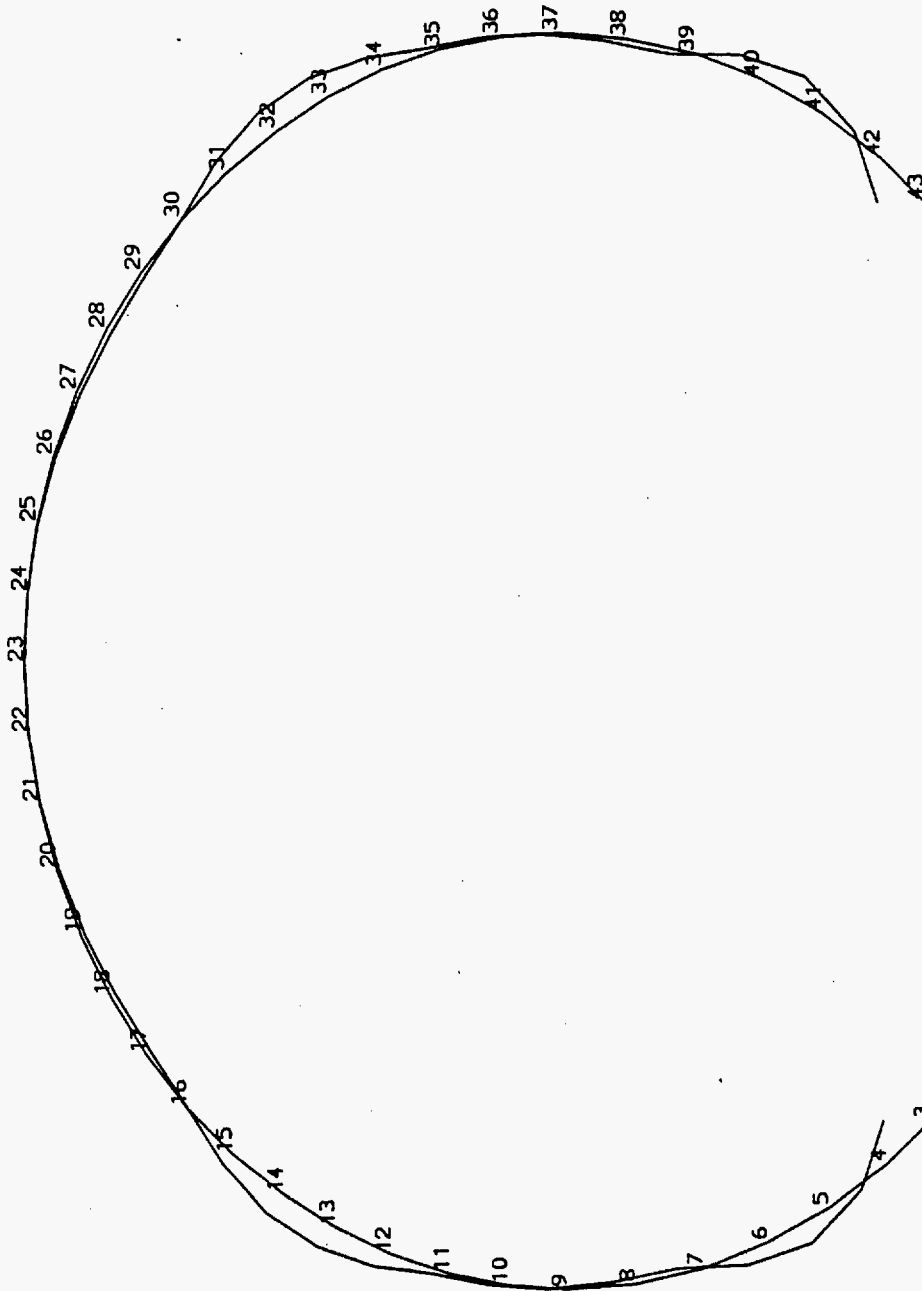
MOMENT MZ LN= 7



STADPL - PLOT (REVISION 16.0) ST22VZ
 TITLE: BABEE0000-01717-0200-00003 ATTACHMENT
 STRUCTURE DATA NJ= 41, NM= 40, NE= 0

COMPANY: M80
 DATE: JUL 18, 1995

DFDR LOAD= 7



FEET KIP

STADPL - PLOT (REVISION 16.0) 5762V2

TITLE: BABEE0000-01717-0200-00003 ATTACHMENT
STRUCTURE DATA NJ= 41, NM= 40, NE= 0

COMPANY: M&O
DATE: JUL 18, 1995


```
*****
*
*           S T A A D - III
*           Revision 16.0b
*           Proprietary Program of
*           RESEARCH ENGINEERS, Inc.
*           Date=      JUL 18, 1995
*           Time=      8:41:10
*
*****
```

```
1. STAAD PLANE BABEE0000-01717-0200-00003 ATTACHMENT I
2. * ESF GROUND SUPPORT-STRUCTURAL STEEL ANALYSIS REV 00
3. * FILE STL RV3A
4. * 25 TON JACKS APPLIED BOTH SIDES @ 49 DEGREES
5. UNIT FT KIP
6. JOINT COORDINATES
7. 3 2.98 2.45 ; 4 2.43 3.13
8. 5 1.58 4.44 ; 6 0.90 5.85 ; 7 0.40 7.33 ; 8 0.10 8.87
9. 9 0.0 10.43 ; 10 0.08 11.79 ; 11 0.31 13.14 ; 12 0.68 14.45
10. 13 1.21 15.71 ; 14 1.86 16.90 ; 15 2.65 18.02 ; 16 3.56 19.03
11. 17 4.58 19.94 ; 18 5.69 20.73 ; 19 6.89 21.39 ; 20 8.15 21.91
12. 21 9.46 22.29 ; 22 10.80 22.52 ; 23 12.17 22.60 ; 24 13.53 22.52
13. 25 14.87 22.29 ; 26 16.18 21.91 ; 27 17.45 21.39 ; 28 18.64 20.73
14. 29 19.75 19.94 ; 30 20.77 19.03 ; 31 21.68 18.02 ; 32 22.47 16.90
15. 33 23.13 15.71 ; 34 23.65 14.45 ; 35 24.03 13.14 ; 36 24.26 11.79
16. 37 24.33 10.43 ; 38 24.23 8.87 ; 39 23.93 7.33 ; 40 23.44 5.85
17. 41 22.76 4.44 ; 42 21.90 3.13 ; 43 21.35 2.45
18. MEMBER INCIDENCE
19. 3 3 4 42
20. UNIT KIP INCH
21. MEMBER PROPERTIES
22. 3 TO 42 TA STA W8X31
23. CONSTANTS
24. E 29000.0 ALL
25. DENSITY 0.00028 ALL
26. BETA 0 ALL
27. UNIT FT
28. SUPPORT
29. 3 7 11 35 39 43 FIXED BUT FY MZ
30. 22 24 FIXED BUT FX MZ
31. 16 30 PINNED
32. UNIT KIP
33. LOAD 1
34. SELF WEIGHT Y -1.0
35. LOADING 2
36. * 25 TON JACKS & SIMULTANEOUS JACKING
37. JOINT LOADING
38. 3 FX -32.80
39. 43 FX 32.80
40. 3 FY 37.74
41. 43 FY 37.74
42. 43 MZ -25.00
43. 3 MZ 25.00
44. LOADING COMBINATION 3
45. 1 2.5 2 1.0
46. PERFORM ANALYSIS
```

P R O B L E M S T A T I S T I C S

NUMBER OF JOINTS/MEMBER+ELEMENTS/SUPPORTS = 41/ 40/ 10
ORIGINAL/FINAL BAND-WIDTH = 1/ 1
TOTAL PRIMARY LOAD CASES = 2, TOTAL DEGREES OF FREEDOM = 111
SIZE OF STIFFNESS MATRIX = 666 DOUBLE PREC. WORDS
TOTAL REQUIRED DISK SPACE = 0.07 MEGA-BYTES

++ PROCESSING ELEMENT STIFFNESS MATRIX. 8:41:13
++ PROCESSING GLOBAL STIFFNESS MATRIX. 8:41:14
++ PROCESSING TRIANGULAR FACTORIZATION. 8:41:14
++ CALCULATING JOINT DISPLACEMENTS. 8:41:14
++ CALCULATING MEMBER FORCES. 8:41:15

47. LOAD LIST 3

48. PRINT ANALYSIS RESULTS

JOINT DISPLACEMENT (INCH RADIANS)

STRUCTURE TYPE = PLANE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
3	3	0.00000	0.06081	0.00000	0.00000	0.00000	0.00305
4	3	-0.02014	0.04214	0.00000	0.00000	0.00000	0.00203
5	3	-0.03488	0.02863	0.00000	0.00000	0.00000	0.00030
6	3	-0.02344	0.03053	0.00000	0.00000	0.00000	-0.00079
7	3	0.00000	0.03514	0.00000	0.00000	0.00000	-0.00060
8	3	0.00086	0.03266	0.00000	0.00000	0.00000	-0.00001
9	3	-0.00094	0.02992	0.00000	0.00000	0.00000	0.00002
10	3	-0.00022	0.02759	0.00000	0.00000	0.00000	0.00002
11	3	0.00000	0.02526	0.00000	0.00000	0.00000	0.00036
12	3	-0.01335	0.02641	0.00000	0.00000	0.00000	0.00055
13	3	-0.02214	0.02730	0.00000	0.00000	0.00000	0.00015
14	3	-0.02144	0.02398	0.00000	0.00000	0.00000	-0.00044
15	3	-0.01195	0.01414	0.00000	0.00000	0.00000	-0.00086
16	3	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00070
17	3	0.00392	-0.00491	0.00000	0.00000	0.00000	-0.00025
18	3	0.00415	-0.00583	0.00000	0.00000	0.00000	0.00000
19	3	0.00300	-0.00450	0.00000	0.00000	0.00000	0.00011
20	3	0.00176	-0.00244	0.00000	0.00000	0.00000	0.00012
21	3	0.00090	-0.00078	0.00000	0.00000	0.00000	0.00008
22	3	0.00039	0.00000	0.00000	0.00000	0.00000	0.00004
23	3	0.00000	0.00050	0.00000	0.00000	0.00000	0.00000
24	3	-0.00038	0.00000	0.00000	0.00000	0.00000	-0.00004
25	3	-0.00088	-0.00078	0.00000	0.00000	0.00000	-0.00008
26	3	-0.00174	-0.00242	0.00000	0.00000	0.00000	-0.00012
27	3	-0.00298	-0.00447	0.00000	0.00000	0.00000	-0.00011
28	3	-0.00413	-0.00581	0.00000	0.00000	0.00000	0.00000
29	3	-0.00391	-0.00490	0.00000	0.00000	0.00000	0.00025
30	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00070
31	3	0.01193	0.01412	0.00000	0.00000	0.00000	0.00086
32	3	0.02142	0.02397	0.00000	0.00000	0.00000	0.00044
33	3	0.02223	0.02738	0.00000	0.00000	0.00000	-0.00015
34	3	0.01325	0.02645	0.00000	0.00000	0.00000	-0.00055
35	3	0.00000	0.02525	0.00000	0.00000	0.00000	-0.00036
36	3	0.00017	0.02757	0.00000	0.00000	0.00000	-0.00003
37	3	0.00065	0.02988	0.00000	0.00000	0.00000	-0.00003
38	3	-0.00111	0.03263	0.00000	0.00000	0.00000	0.00002
39	3	0.00000	0.03506	0.00000	0.00000	0.00000	0.00062
40	3	0.02391	0.03043	0.00000	0.00000	0.00000	0.00080
41	3	0.03542	0.02849	0.00000	0.00000	0.00000	-0.00031
42	3	0.02033	0.04237	0.00000	0.00000	0.00000	-0.00206
43	3	0.00000	0.06120	0.00000	0.00000	0.00000	-0.00308

SUPPORT REACTIONS -UNIT KIP FEET STRUCTURE TYPE = PLANE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
3	3	4.96	0.00	0.00	0.00	0.00	0.00
7	3	28.01	0.00	0.00	0.00	0.00	0.00
11	3	20.12	0.00	0.00	0.00	0.00	0.00
35	3	-20.18	0.00	0.00	0.00	0.00	0.00
39	3	-28.02	0.00	0.00	0.00	0.00	0.00
43	3	-4.93	0.00	0.00	0.00	0.00	0.00
22	3	0.00	-1.08	0.00	0.00	0.00	0.00
24	3	0.00	-1.09	0.00	0.00	0.00	0.00
16	3	-14.50	-34.52	0.00	0.00	0.00	0.00
30	3	14.54	-34.52	0.00	0.00	0.00	0.00

MEMBER END FORCES STRUCTURE TYPE = PLANE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
3	3	3	46.85	2.09	0.00	0.00	0.00	-25.00
		4	-46.80	-2.04	0.00	0.00	0.00	26.81
4	3	4	46.76	-2.85	0.00	0.00	0.00	-26.81
		5	-46.66	2.91	0.00	0.00	0.00	22.31
5	3	5	45.92	-8.76	0.00	0.00	0.00	-22.31
		6	-45.81	8.82	0.00	0.00	0.00	8.54
6	3	6	44.37	-14.40	0.00	0.00	0.00	-8.54
		7	-44.26	14.43	0.00	0.00	0.00	-13.97
7	3	7	36.59	7.30	0.00	0.00	0.00	13.97
		8	-36.47	-7.27	0.00	0.00	0.00	-2.54
8	3	8	37.11	2.55	0.00	0.00	0.00	2.54
		9	-36.99	-2.54	0.00	0.00	0.00	1.43
9	3	9	37.02	2.01	0.00	0.00	0.00	1.43
		10	-36.91	-2.00	0.00	0.00	0.00	1.30
10	3	10	36.47	6.04	0.00	0.00	0.00	-1.30
		11	-36.37	-6.03	0.00	0.00	0.00	9.57
11	3	11	40.99	-9.50	0.00	0.00	0.00	-9.57
		12	-40.89	9.53	0.00	0.00	0.00	-3.38
12	3	12	41.75	-4.44	0.00	0.00	0.00	3.38
		13	-41.65	4.48	0.00	0.00	0.00	-9.48
13	3	13	41.89	-0.23	0.00	0.00	0.00	9.48
		14	-41.80	0.28	0.00	0.00	0.00	-9.83
14	3	14	41.56	4.49	0.00	0.00	0.00	9.83
		15	-41.47	-4.43	0.00	0.00	0.00	-3.71
15	3	15	40.65	9.33	0.00	0.00	0.00	3.71
		16	-40.58	-9.26	0.00	0.00	0.00	8.92
16	3	16	5.53	-2.49	0.00	0.00	0.00	-8.92
		17	-5.46	2.57	0.00	0.00	0.00	5.45
17	3	17	5.71	-1.96	0.00	0.00	0.00	-5.45
		18	-5.65	2.04	0.00	0.00	0.00	2.73
18	3	18	5.85	-1.38	0.00	0.00	0.00	-2.73
		19	-5.80	1.47	0.00	0.00	0.00	0.78

MEMBER END FORCES STRUCTURE TYPE = PLANE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
19	3	19	5.92	-0.82	0.00	0.00	0.00	-0.78
		20	-5.88	0.91	0.00	0.00	0.00	-0.40
20	3	20	5.95	-0.27	0.00	0.00	0.00	0.40
		21	-5.92	0.37	0.00	0.00	0.00	-0.83
21	3	21	5.92	0.30	0.00	0.00	0.00	0.83
		22	-5.90	-0.20	0.00	0.00	0.00	-0.49
22	3	22	5.78	-0.23	0.00	0.00	0.00	0.49
		23	-5.78	0.34	0.00	0.00	0.00	-0.88
23	3	23	5.78	0.34	0.00	0.00	0.00	0.88
		24	-5.78	-0.24	0.00	0.00	0.00	-0.49
24	3	24	5.90	-0.20	0.00	0.00	0.00	0.49
		25	-5.92	0.30	0.00	0.00	0.00	-0.83
25	3	25	5.92	0.37	0.00	0.00	0.00	0.83
		26	-5.95	-0.27	0.00	0.00	0.00	-0.40
26	3	26	5.89	0.89	0.00	0.00	0.00	0.40
		27	-5.93	-0.80	0.00	0.00	0.00	0.76
27	3	27	5.79	1.49	0.00	0.00	0.00	-0.76
		28	-5.84	-1.40	0.00	0.00	0.00	2.73
28	3	28	5.65	2.04	0.00	0.00	0.00	-2.73
		29	-5.71	-1.96	0.00	0.00	0.00	5.45
29	3	29	5.46	2.57	0.00	0.00	0.00	-5.45
		30	-5.53	-2.49	0.00	0.00	0.00	8.91
30	3	30	40.60	-9.22	0.00	0.00	0.00	-8.91
		31	-40.68	9.29	0.00	0.00	0.00	-3.68
31	3	31	41.50	-4.40	0.00	0.00	0.00	3.68
		32	-41.58	4.46	0.00	0.00	0.00	-9.74
32	3	32	41.82	0.05	0.00	0.00	0.00	9.74
		33	-41.91	0.00	0.00	0.00	0.00	-9.71
33	3	33	41.64	4.81	0.00	0.00	0.00	9.71
		34	-41.73	-4.77	0.00	0.00	0.00	-3.19
34	3	34	40.97	9.28	0.00	0.00	0.00	3.19
		35	-41.07	-9.25	0.00	0.00	0.00	9.45
35	3	35	36.36	-6.05	0.00	0.00	0.00	-9.45
		36	-36.47	6.06	0.00	0.00	0.00	1.16

MEMBER END FORCES STRUCTURE TYPE = PLANE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
36	3	36	36.93	-1.75	0.00	0.00	0.00	-1.16
		37	-37.03	1.76	0.00	0.00	0.00	-1.23
37	3	37	36.99	-2.52	0.00	0.00	0.00	-1.23
		38	-37.11	2.53	0.00	0.00	0.00	-2.71
38	3	38	36.48	-7.26	0.00	0.00	0.00	2.71
		39	-36.60	7.28	0.00	0.00	0.00	-14.12
39	3	39	44.18	14.73	0.00	0.00	0.00	14.12
		40	-44.30	-14.69	0.00	0.00	0.00	8.82
40	3	40	45.82	8.84	0.00	0.00	0.00	-8.82
		41	-45.93	-8.79	0.00	0.00	0.00	22.62
41	3	41	46.69	2.69	0.00	0.00	0.00	-22.62
		42	-46.79	-2.62	0.00	0.00	0.00	26.79
42	3	42	46.82	-2.02	0.00	0.00	0.00	-26.79
		43	-46.87	2.06	0.00	0.00	0.00	25.00

***** END OF LATEST ANALYSIS RESULT *****

49. CHECK CODE ALL

STAAD-III CODE CHECKING - (AISC)

ALL UNITS ARE - KIP FEET (UNLESS OTHERWISE NOTED)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
=====					
3	ST W8X 31	PASS	AISC- H1-2	0.730	3
		46.80 C	0.00	26.81	0.87
4	ST W8X 31	PASS	AISC- H1-2	0.729	3
		46.76 C	0.00	-26.81	0.00
5	ST W8X 31	PASS	AISC- H1-2	0.642	3
		45.92 C	0.00	-22.31	0.00
6	ST W8X 31	PASS	AISC- H1-2	0.481	3
		44.26 C	0.00	-13.97	1.56
7	ST W8X 31	PASS	AISC- H1-2	0.442	3
		36.59 C	0.00	13.97	0.00
8	ST W8X 31	PASS	AISC- H1-2	0.235	3
		37.11 C	0.00	2.54	0.00
9	ST W8X 31	PASS	AISC- H1-2	0.214	3
		37.02 C	0.00	1.43	0.00
10	ST W8X 31	PASS	AISC- H1-2	0.360	3
		36.37 C	0.00	9.57	1.37
11	ST W8X 31	PASS	AISC- H1-2	0.384	3
		40.99 C	0.00	-9.57	0.00
12	ST W8X 31	PASS	AISC- H1-2	0.385	3
		41.65 C	0.00	-9.48	1.37
13	ST W8X 31	PASS	AISC- H1-2	0.392	3
		41.80 C	0.00	-9.83	1.36
14	ST W8X 31	PASS	AISC- H1-2	0.391	3
		41.56 C	0.00	9.83	0.00
15	ST W8X 31	PASS	AISC- H1-2	0.370	3
		40.58 C	0.00	8.92	1.36
16	ST W8X 31	PASS	AISC- H1-3	0.192	3
		5.53 C	0.00	-8.92	0.00
17	ST W8X 31	PASS	AISC- H1-3	0.130	3
		5.71 C	0.00	-5.45	0.00
18	ST W8X 31	PASS	AISC- H1-3	0.080	3
		5.85 C	0.00	-2.73	0.00
19	ST W8X 31	PASS	AISC- H1-3	0.045	3
		5.92 C	0.00	-0.78	0.00
20	ST W8X 31	PASS	AISC- H1-3	0.046	3
		5.92 C	0.00	-0.83	1.36
21	ST W8X 31	PASS	AISC- H1-3	0.046	3
		5.92 C	0.00	0.83	0.00
22	ST W8X 31	PASS	AISC- H1-3	0.046	3
		5.78 C	0.00	-0.88	1.37
23	ST W8X 31	PASS	AISC- H1-3	0.046	3
		5.78 C	0.00	0.88	0.00
24	ST W8X 31	PASS	AISC- H1-3	0.046	3
		5.92 C	0.00	-0.83	1.36
25	ST W8X 31	PASS	AISC- H1-3	0.046	3
		5.92 C	0.00	0.83	0.00
26	ST W8X 31	PASS	AISC- H1-3	0.045	3
		5.93 C	0.00	0.76	1.37

L UNITS ARE - KIP FEET (UNLESS OTHERWISE NOTED)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
=====					
27	ST W8X 31	PASS	AISC- H1-3	0.080	3
		5.84 C	0.00	2.73	1.36
28	ST W8X 31	PASS	AISC- H1-3	0.130	3
		5.71 C	0.00	5.45	1.36
29	ST W8X 31	PASS	AISC- H1-3	0.192	3
		5.53 C	0.00	8.91	1.37
30	ST W8X 31	PASS	AISC- H1-2	0.370	3
		40.60 C	0.00	-8.91	0.00
31	ST W8X 31	PASS	AISC- H1-2	0.390	3
		41.58 C	0.00	-9.74	1.37
32	ST W8X 31	PASS	AISC- H1-2	0.391	3
		41.82 C	0.00	9.74	0.00
33	ST W8X 31	PASS	AISC- H1-2	0.389	3
		41.64 C	0.00	9.71	0.00
34	ST W8X 31	PASS	AISC- H1-2	0.382	3
		41.07 C	0.00	9.45	1.36
35	ST W8X 31	PASS	AISC- H1-2	0.358	3
		36.36 C	0.00	-9.45	0.00
36	ST W8X 31	PASS	AISC- H1-2	0.210	3
		37.03 C	0.00	-1.23	1.36
37	ST W8X 31	PASS	AISC- H1-2	0.238	3
		37.11 C	0.00	-2.71	1.56
38	ST W8X 31	PASS	AISC- H1-2	0.445	3
		36.60 C	0.00	-14.12	1.57
39	ST W8X 31	PASS	AISC- H1-2	0.483	3
		44.18 C	0.00	14.12	0.00
40	ST W8X 31	PASS	AISC- H1-2	0.648	3
		45.93 C	0.00	22.62	1.57
41	ST W8X 31	PASS	AISC- H1-2	0.729	3
		46.79 C	0.00	26.79	1.57
42	ST W8X 31	PASS	AISC- H1-2	0.729	3
		46.82 C	0.00	-26.79	0.00

***** END OF TABULATED RESULT OF DESIGN *****

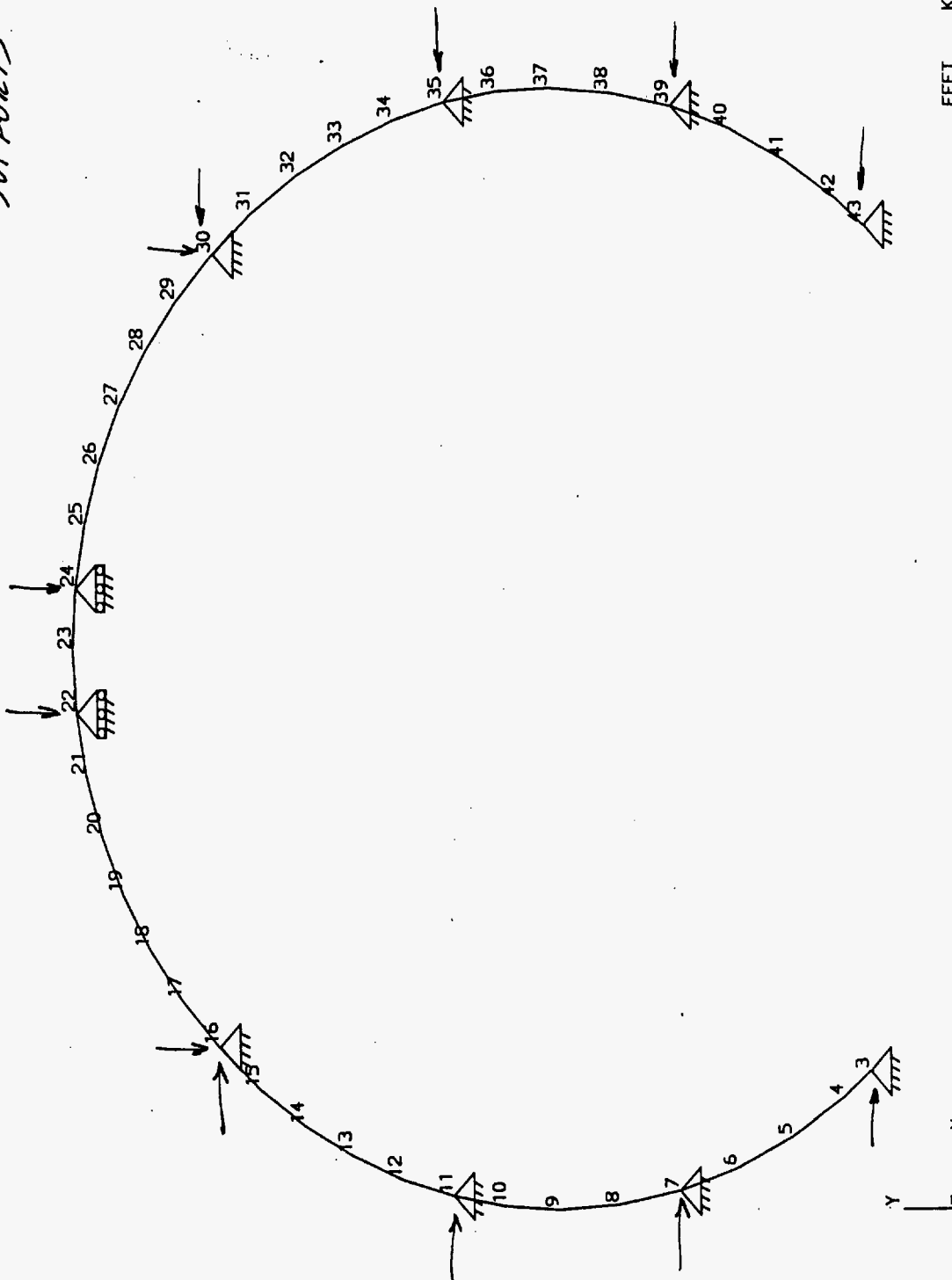
50. PLOT DISPLACEMENT FILE
 51. PLOT BENDING FILE
 52. FINISH

***** END OF STAAD-III *****

DATE= JUL 18,1995 TIME= 8:41:18 *****

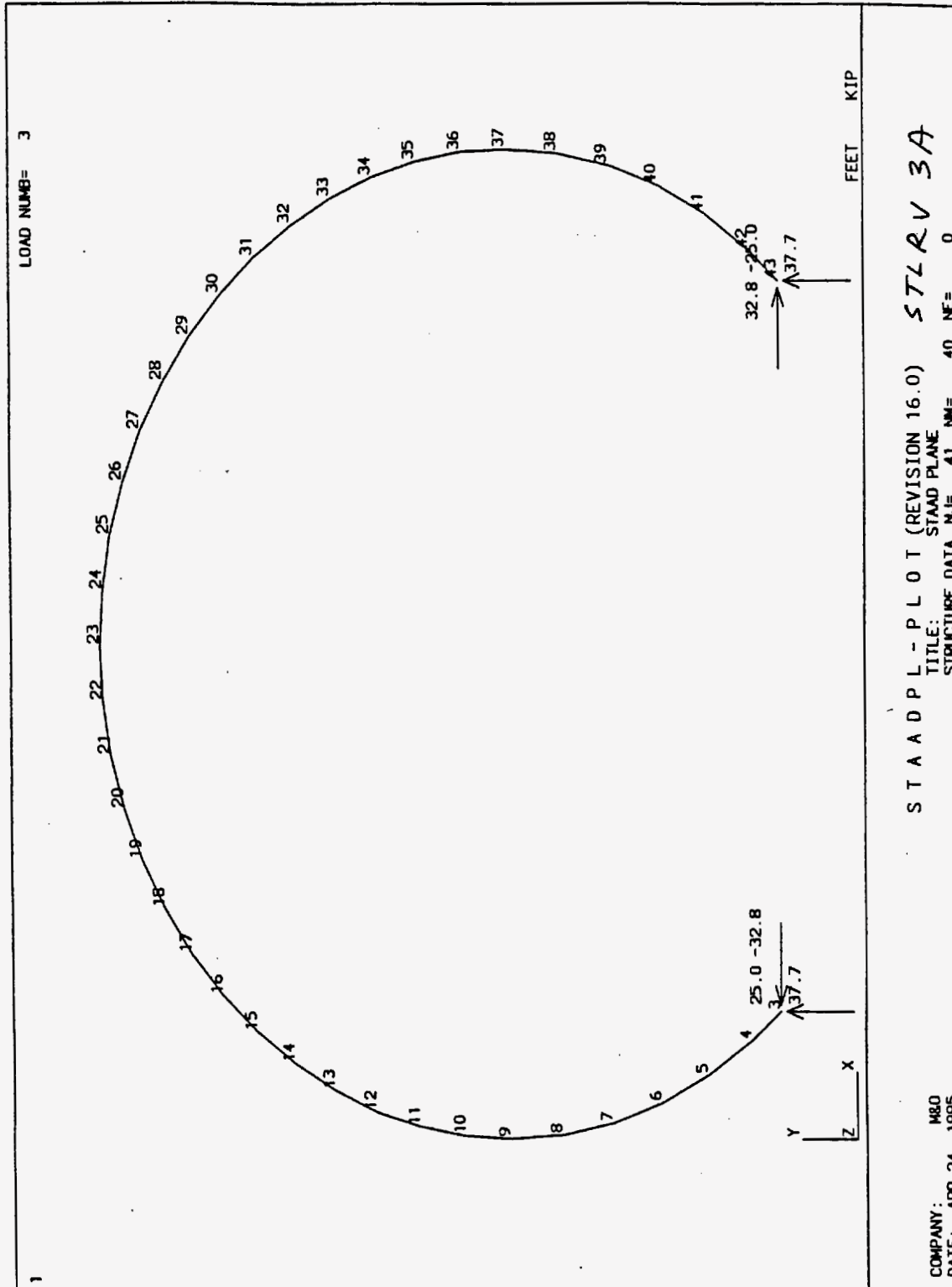
 * For questions on STAAD-III/ISDS, contact: *
 * RESEARCH ENGINEERS, Inc at (714) 974-2500 *

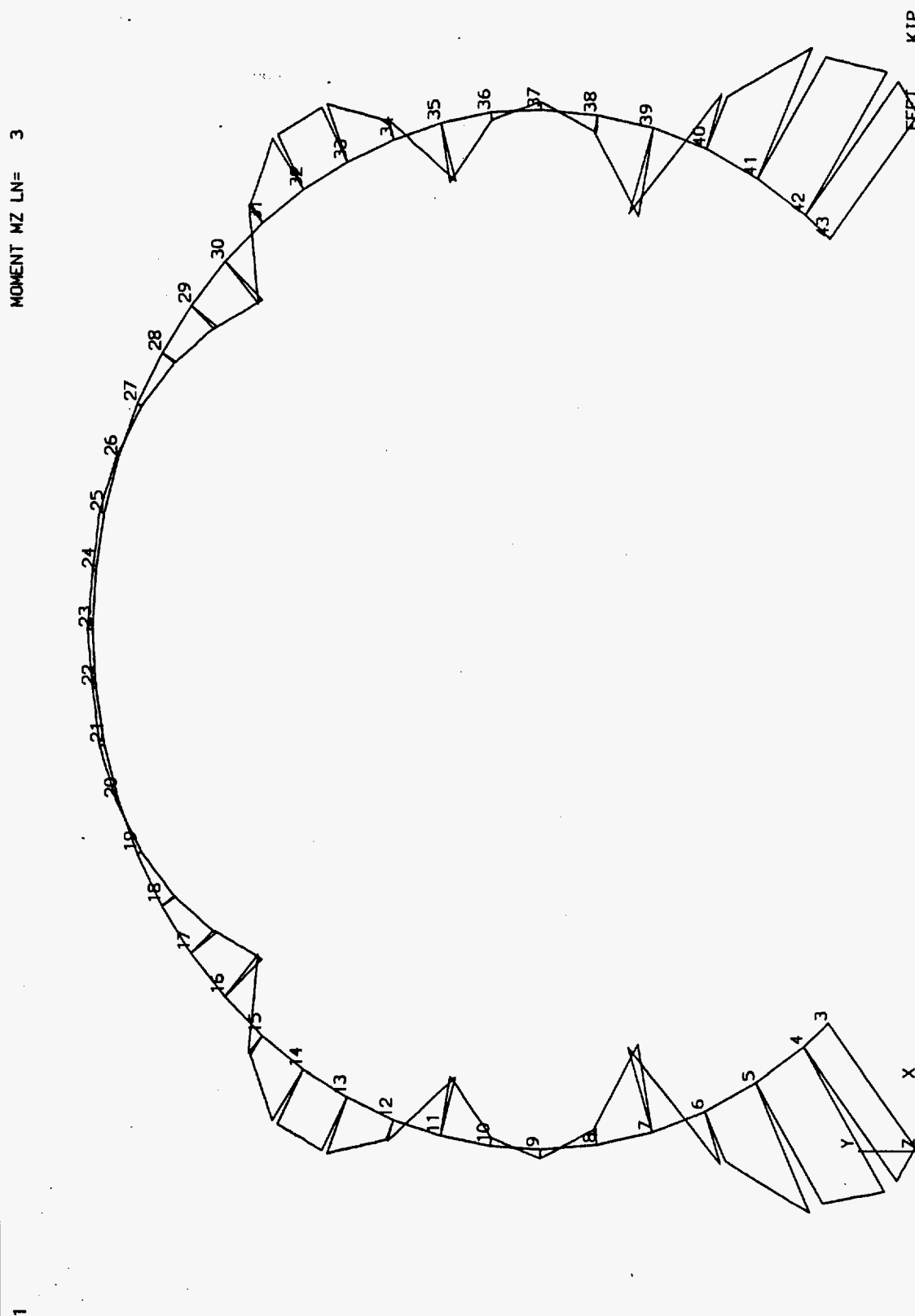
SUPPORTS



STADPL - PLOT (REVISION 16.0) ST2LV3A
 TITLE: BABEE0000-01717-0200-00003 ATTACHMENT
 STRUCTURE DATA NJ= 41, NM= 40, NE= 0

COMPANY: M&O
 DATE: JUL 18, 1995

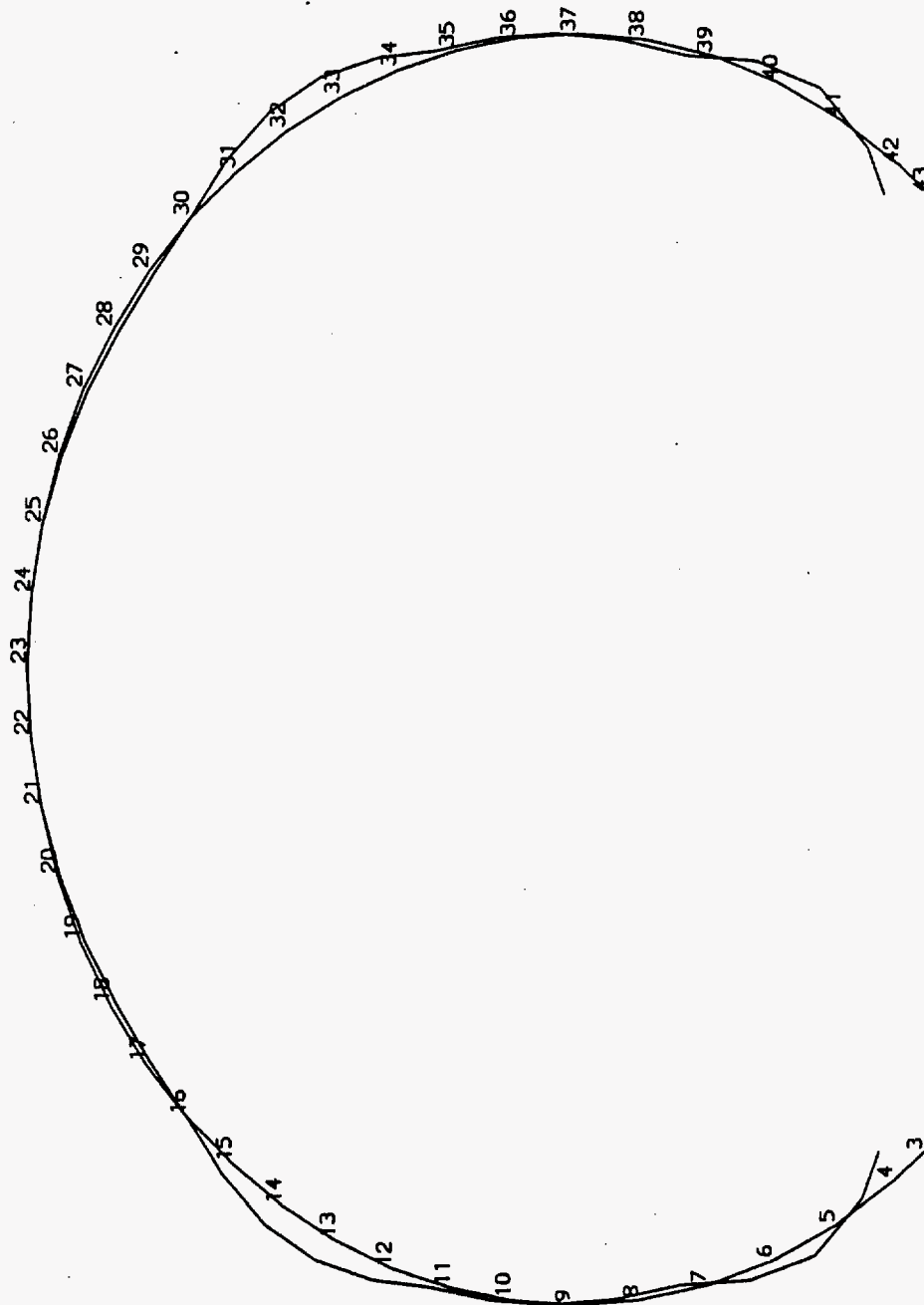




STAAD PL - PLOT (REVISION 16.0) *STLR V 3A*
 TITLE: BABEE0000-01717-0200-00003 ATTACHMENT
 STRUCTURE DATA NJ= 41, NM= 40, NE= 0

COMPANY: M&O
 DATE: JUL 18, 1995

DFDR LOAD= 3



FEET KIP

STAAD PL - PLOT (REVISION 16.0) *STRV 3A*
TITLE: BABEE0000-01717-0200-00003 ATTACHMENT
STRUCTURE DATA NJ= 41, NM= 40, NE= 0

COMPANY: M80
DATE: JUL 18, 1995

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*****
*
*           S T A A D - III
*           Revision 16.0b
*           Proprietary Program of
*           RESEARCH ENGINEERS, Inc.
*           Date=      JUL 18, 1995
*           Time=      9: 1:57
*
*****
```

```
1. STAAD PLANE BABEE0000-01717-0200-00003 ATTACHMENT I
2. * ESF GROUND SUPPORT-STRUCTURAL STEEL ANALYSIS REV 00
3. * FILE STLVR3D
4. * 25 TON JACKS APPLIED BOTH SIDES @ 51 DEGREES
5. UNIT FT KIP
6. JOINT COORDINATES
7. 3 2.71 2.77 ; 4 2.43 3.13
8. 5 1.58 4.44 ; 6 0.90 5.85 ; 7 0.40 7.33 ; 8 0.10 8.87
9. 9 0.0 10.43 ; 10 0.08 11.79 ; 11 0.31 13.14 ; 12 0.68 14.45
10. 13 1.21 15.71 ; 14 1.86 16.90 ; 15 2.65 18.02 ; 16 3.56 19.03
11. 17 4.58 19.94 ; 18 5.69 20.73 ; 19 6.89 21.39 ; 20 8.15 21.91
12. 21 9.46 22.29 ; 22 10.80 22.52 ; 23 12.17 22.60 ; 24 13.53 22.52
13. 25 14.87 22.29 ; 26 16.18 21.91 ; 27 17.45 21.39 ; 28 18.64 20.73
14. 29 19.75 19.94 ; 30 20.77 19.03 ; 31 21.68 18.02 ; 32 22.47 16.90
15. 33 23.13 15.71 ; 34 23.65 14.45 ; 35 24.03 13.14 ; 36 24.26 11.79
16. 37 24.33 10.43 ; 38 24.23 8.87 ; 39 23.93 7.33 ; 40 23.44 5.85
17. 41 22.76 4.44 ; 42 21.90 3.13 ; 43 21.62 2.77
18. MEMBER INCIDENCE
19. 3 3 4 42
20. UNIT KIP INCH
21. MEMBER PROPERTIES
22. 3 TO 42 TA STA W8X31
23. CONSTANTS
24. E 29000.0 ALL
25. DENSITY 0.00028 ALL
26. BETA 0 ALL
27. UNIT FT
28. SUPPORT
29. 3 7 11 35 39 43 FIXED BUT FY MZ
30. 22 24 FIXED BUT FX MZ
31. 16 30 PINNED
32. UNIT KIP
33. LOAD 1
34. SELF WEIGHT Y -1.0
35. LOADING 2
36. * 25 TON JACKS & SIMULTANEOUS JACKING
37. JOINT LOADING
38. 3 FX -31.47
39. 43 FX 31.47
40. 3 43 FY 38.86
41. 43 MZ -25.00
42. 3 MZ 25.00
43. LOADING COMBINATION 3
44. 1 2.5 2 1.0
```

P R O B L E M S T A T I S T I C S

NUMBER OF JOINTS/MEMBER+ELEMENTS/SUPPORTS = 41/ 40/ 10
ORIGINAL/FINAL BAND-WIDTH = 1/ 1
TOTAL PRIMARY LOAD CASES = 2, TOTAL DEGREES OF FREEDOM = 111
SIZE OF STIFFNESS MATRIX = 666 DOUBLE PREC. WORDS
TOTAL REQUIRED DISK SPACE = 0.07 MEGA-BYTES

++ PROCESSING ELEMENT STIFFNESS MATRIX.	9: 2: 0
++ PROCESSING GLOBAL STIFFNESS MATRIX.	9: 2: 1
++ PROCESSING TRIANGULAR FACTORIZATION.	9: 2: 1
++ CALCULATING JOINT DISPLACEMENTS.	9: 2: 1
++ CALCULATING MEMBER FORCES.	9: 2: 2

46. LOAD LIST 3

47. PRINT ANALYSIS RESULTS

JOINT DISPLACEMENT (INCH RADIANS)

STRUCTURE TYPE = PLANE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
3	3	0.00000	0.05793	0.00000	0.00000	0.00000	0.00273
4	3	-0.01029	0.04868	0.00000	0.00000	0.00000	0.00220
5	3	-0.02835	0.03294	0.00000	0.00000	0.00000	0.00051
6	3	-0.02052	0.03302	0.00000	0.00000	0.00000	-0.00060
7	3	0.00000	0.03655	0.00000	0.00000	0.00000	-0.00048
8	3	-0.00054	0.03372	0.00000	0.00000	0.00000	0.00003
9	3	-0.00238	0.03088	0.00000	0.00000	0.00000	0.00001
10	3	-0.00098	0.02845	0.00000	0.00000	0.00000	-0.00002
11	3	0.00000	0.02592	0.00000	0.00000	0.00000	0.00034
12	3	-0.01348	0.02702	0.00000	0.00000	0.00000	0.00055
13	3	-0.02249	0.02792	0.00000	0.00000	0.00000	0.00016
14	3	-0.02186	0.02454	0.00000	0.00000	0.00000	-0.00045
15	3	-0.01221	0.01448	0.00000	0.00000	0.00000	-0.00088
16	3	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00071
17	3	0.00401	-0.00501	0.00000	0.00000	0.00000	-0.00026
18	3	0.00424	-0.00596	0.00000	0.00000	0.00000	0.00000
19	3	0.00307	-0.00459	0.00000	0.00000	0.00000	0.00011
20	3	0.00180	-0.00249	0.00000	0.00000	0.00000	0.00012
21	3	0.00092	-0.00080	0.00000	0.00000	0.00000	0.00008
22	3	0.00040	0.00000	0.00000	0.00000	0.00000	0.00004
23	3	0.00001	0.00051	0.00000	0.00000	0.00000	0.00000
24	3	-0.00039	0.00000	0.00000	0.00000	0.00000	-0.00004
25	3	-0.00090	-0.00079	0.00000	0.00000	0.00000	-0.00008
26	3	-0.00178	-0.00247	0.00000	0.00000	0.00000	-0.00012
27	3	-0.00304	-0.00457	0.00000	0.00000	0.00000	-0.00011
28	3	-0.00422	-0.00593	0.00000	0.00000	0.00000	0.00000
29	3	-0.00400	-0.00500	0.00000	0.00000	0.00000	0.00026
30	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00071
31	3	0.01219	0.01446	0.00000	0.00000	0.00000	0.00088
32	3	0.02184	0.02453	0.00000	0.00000	0.00000	0.00045
33	3	0.02259	0.02799	0.00000	0.00000	0.00000	-0.00016
34	3	0.01337	0.02706	0.00000	0.00000	0.00000	-0.00055
35	3	0.00000	0.02591	0.00000	0.00000	0.00000	-0.00034
36	3	0.00094	0.02843	0.00000	0.00000	0.00000	0.00001
37	3	0.00209	0.03085	0.00000	0.00000	0.00000	-0.00001
38	3	0.00028	0.03367	0.00000	0.00000	0.00000	-0.00002
39	3	0.00000	0.03646	0.00000	0.00000	0.00000	0.00050
40	3	0.02099	0.03289	0.00000	0.00000	0.00000	0.00062
41	3	0.02886	0.03279	0.00000	0.00000	0.00000	-0.00052
42	3	0.01040	0.04896	0.00000	0.00000	0.00000	-0.00223
43	3	0.00000	0.05830	0.00000	0.00000	0.00000	-0.00275

SUPPORT REACTIONS -UNIT KIP FEET STRUCTURE TYPE = PLANE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
3	3	3.59	0.00	0.00	0.00	0.00	0.00
7	3	27.72	0.00	0.00	0.00	0.00	0.00
11	3	21.16	0.00	0.00	0.00	0.00	0.00
35	3	-21.23	0.00	0.00	0.00	0.00	0.00
39	3	-27.72	0.00	0.00	0.00	0.00	0.00
43	3	-3.56	0.00	0.00	0.00	0.00	0.00
22	3	0.00	-1.11	0.00	0.00	0.00	0.00
24	3	0.00	-1.12	0.00	0.00	0.00	0.00
16	3	-15.09	-35.64	0.00	0.00	0.00	0.00
30	3	15.13	-35.64	0.00	0.00	0.00	0.00

MEMBER END FORCES STRUCTURE TYPE = PLANE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
3	3	3	47.79	1.85	0.00	0.00	0.00	-25.00
		4	-47.77	-1.83	0.00	0.00	0.00	25.84
4	3	4	47.75	-2.26	0.00	0.00	0.00	-25.84
		5	-47.65	2.32	0.00	0.00	0.00	22.26
5	3	5	46.98	-8.30	0.00	0.00	0.00	-22.26
		6	-46.87	8.35	0.00	0.00	0.00	9.22
6	3	6	45.48	-14.07	0.00	0.00	0.00	-9.22
		7	-45.37	14.11	0.00	0.00	0.00	-12.78
7	3	7	37.79	7.19	0.00	0.00	0.00	12.78
		8	-37.67	-7.17	0.00	0.00	0.00	-1.52
8	3	8	38.28	2.29	0.00	0.00	0.00	1.52
		9	-38.16	-2.28	0.00	0.00	0.00	2.05
9	3	9	38.15	2.41	0.00	0.00	0.00	2.05
		10	-38.05	-2.41	0.00	0.00	0.00	1.24
10	3	10	37.55	6.57	0.00	0.00	0.00	-1.24
		11	-37.45	-6.55	0.00	0.00	0.00	10.22
11	3	11	42.29	-9.87	0.00	0.00	0.00	-10.22
		12	-42.19	9.90	0.00	0.00	0.00	-3.24
12	3	12	43.09	-4.65	0.00	0.00	0.00	3.24
		13	-42.99	4.69	0.00	0.00	0.00	-9.63
13	3	13	43.24	-0.30	0.00	0.00	0.00	9.63
		14	-43.15	0.35	0.00	0.00	0.00	-10.07
14	3	14	42.91	4.58	0.00	0.00	0.00	10.07
		15	-42.82	-4.51	0.00	0.00	0.00	-3.84
15	3	15	41.99	9.57	0.00	0.00	0.00	3.84
		16	-41.91	-9.50	0.00	0.00	0.00	9.12
16	3	16	5.64	-2.55	0.00	0.00	0.00	-9.12
		17	-5.57	2.63	0.00	0.00	0.00	5.58
17	3	17	5.82	-2.00	0.00	0.00	0.00	-5.58
		18	-5.76	2.09	0.00	0.00	0.00	2.79
18	3	18	5.97	-1.41	0.00	0.00	0.00	-2.79
		19	-5.92	1.50	0.00	0.00	0.00	0.79

MEMBER END FORCES STRUCTURE TYPE = PLANE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
19	3	19	6.05	-0.84	0.00	0.00	0.00	-0.79
		20	-6.01	0.93	0.00	0.00	0.00	-0.41
20	3	20	6.07	-0.27	0.00	0.00	0.00	0.41
		21	-6.04	0.37	0.00	0.00	0.00	-0.85
21	3	21	6.05	0.31	0.00	0.00	0.00	0.85
		22	-6.03	-0.20	0.00	0.00	0.00	-0.50
22	3	22	5.90	-0.24	0.00	0.00	0.00	0.50
		23	-5.90	0.34	0.00	0.00	0.00	-0.90
23	3	23	5.90	0.35	0.00	0.00	0.00	0.90
		24	-5.90	-0.24	0.00	0.00	0.00	-0.50
24	3	24	6.03	-0.21	0.00	0.00	0.00	0.50
		25	-6.05	0.31	0.00	0.00	0.00	-0.85
25	3	25	6.04	0.37	0.00	0.00	0.00	0.85
		26	-6.07	-0.27	0.00	0.00	0.00	-0.41
26	3	26	6.01	0.91	0.00	0.00	0.00	0.41
		27	-6.05	-0.82	0.00	0.00	0.00	0.78
27	3	27	5.91	1.52	0.00	0.00	0.00	-0.78
		28	-5.96	-1.43	0.00	0.00	0.00	2.79
28	3	28	5.77	2.09	0.00	0.00	0.00	-2.79
		29	-5.83	-2.00	0.00	0.00	0.00	5.57
29	3	29	5.57	2.63	0.00	0.00	0.00	-5.57
		30	-5.64	-2.55	0.00	0.00	0.00	9.12
30	3	30	41.94	-9.47	0.00	0.00	0.00	-9.12
		31	-42.02	9.54	0.00	0.00	0.00	-3.80
31	3	31	42.85	-4.48	0.00	0.00	0.00	3.80
		32	-42.94	4.54	0.00	0.00	0.00	-9.98
32	3	32	43.18	0.11	0.00	0.00	0.00	9.98
		33	-43.27	-0.06	0.00	0.00	0.00	-9.86
33	3	33	42.97	5.03	0.00	0.00	0.00	9.86
		34	-43.07	-4.99	0.00	0.00	0.00	-3.04
34	3	34	42.27	9.65	0.00	0.00	0.00	3.04
		35	-42.37	-9.62	0.00	0.00	0.00	10.10
35	3	35	37.44	-6.57	0.00	0.00	0.00	-10.10
		36	-37.55	6.59	0.00	0.00	0.00	1.09

MEMBER END FORCES STRUCTURE TYPE = PLANE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
36	3	36	38.06	-2.15	0.00	0.00	0.00	-1.09
		37	-38.16	2.15	0.00	0.00	0.00	-1.84
37	3	37	38.16	-2.26	0.00	0.00	0.00	-1.84
		38	-38.28	2.26	0.00	0.00	0.00	-1.69
38	3	38	37.67	-7.15	0.00	0.00	0.00	1.69
		39	-37.79	7.17	0.00	0.00	0.00	-12.92
39	3	39	45.29	14.41	0.00	0.00	0.00	12.92
		40	-45.40	-14.37	0.00	0.00	0.00	9.52
40	3	40	46.88	8.38	0.00	0.00	0.00	-9.52
		41	-46.99	-8.33	0.00	0.00	0.00	22.60
41	3	41	47.67	2.09	0.00	0.00	0.00	-22.60
		42	-47.78	-2.03	0.00	0.00	0.00	25.83
42	3	42	47.78	-1.80	0.00	0.00	0.00	-25.83
		43	-47.81	1.82	0.00	0.00	0.00	25.00

***** END OF LATEST ANALYSIS RESULT *****

48. CHECK CODE ALL

STAAD-III CODE CHECKING - (AISC)

ALL UNITS ARE - KIP FEET (UNLESS OTHERWISE NOTED)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
3	ST W8X 31	PASS 47.77 C	AISC- H1-2 0.00	0.717 25.84	3 0.46
4	ST W8X 31	PASS 47.75 C	AISC- H1-2 0.00	0.717 -25.84	3 0.00
5	ST W8X 31	PASS 46.98 C	AISC- H1-2 0.00	0.647 -22.26	3 0.00
6	ST W8X 31	PASS 45.37 C	AISC- H1-2 0.00	0.465 -12.78	3 1.56
7	ST W8X 31	PASS 37.79 C	AISC- H1-2 0.00	0.426 12.78	3 0.00
8	ST W8X 31	PASS 38.16 C	AISC- H1-2 0.00	0.231 2.05	3 1.56
9	ST W8X 31	PASS 38.15 C	AISC- H1-2 0.00	0.231 2.05	3 0.00
10	ST W8X 31	PASS 37.45 C	AISC- H1-2 0.00	0.378 10.22	3 1.37
11	ST W8X 31	PASS 42.29 C	AISC- H1-2 0.00	0.402 -10.22	3 0.00
12	ST W8X 31	PASS 42.99 C	AISC- H1-2 0.00	0.395 -9.63	3 1.37
13	ST W8X 31	PASS 43.15 C	AISC- H1-2 0.00	0.404 -10.07	3 1.36
14	ST W8X 31	PASS 42.91 C	AISC- H1-2 0.00	0.403 10.07	3 0.00
15	ST W8X 31	PASS 41.91 C	AISC- H1-2 0.00	0.380 9.12	3 1.36
16	ST W8X 31	PASS 5.64 C	AISC- H1-3 0.00	0.197 -9.12	3 0.00
17	ST W8X 31	PASS 5.82 C	AISC- H1-3 0.00	0.132 -5.58	3 0.00
18	ST W8X 31	PASS 5.97 C	AISC- H1-3 0.00	0.082 -2.79	3 0.00
19	ST W8X 31	PASS 6.05 C	AISC- H1-3 0.00	0.046 -0.79	3 0.00
20	ST W8X 31	PASS 6.04 C	AISC- H1-3 0.00	0.047 -0.85	3 1.36
21	ST W8X 31	PASS 6.05 C	AISC- H1-3 0.00	0.047 0.85	3 0.00
22	ST W8X 31	PASS 5.90 C	AISC- H1-3 0.00	0.047 -0.90	3 1.37
23	ST W8X 31	PASS 5.90 C	AISC- H1-3 0.00	0.047 0.90	3 0.00
24	ST W8X 31	PASS 6.05 C	AISC- H1-3 0.00	0.047 -0.85	3 1.36
25	ST W8X 31	PASS 6.04 C	AISC- H1-3 0.00	0.047 0.85	3 0.00
26	ST W8X 31	PASS 6.05 C	AISC- H1-3 0.00	0.046 0.78	3 1.37

ALL UNITS ARE - KIP FEET (UNLESS OTHERWISE NOTED)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
27	ST W8X 31	PASS	AISC- H1-3	0.082	3
		5.96 C	0.00	2.79	1.36
28	ST W8X 31	PASS	AISC- H1-3	0.132	3
		5.83 C	0.00	5.57	1.36
29	ST W8X 31	PASS	AISC- H1-3	0.196	3
		5.64 C	0.00	9.12	1.37
30	ST W8X 31	PASS	AISC- H1-2	0.380	3
		41.94 C	0.00	-9.12	0.00
31	ST W8X 31	PASS	AISC- H1-2	0.401	3
		42.94 C	0.00	-9.98	1.37
32	ST W8X 31	PASS	AISC- H1-2	0.402	3
		43.18 C	0.00	9.98	0.00
33	ST W8X 31	PASS	AISC- H1-2	0.399	3
		42.97 C	0.00	9.86	0.00
34	ST W8X 31	PASS	AISC- H1-2	0.400	3
		42.37 C	0.00	10.10	1.36
35	ST W8X 31	PASS	AISC- H1-2	0.375	3
		37.44 C	0.00	-10.10	0.00
36	ST W8X 31	PASS	AISC- H1-2	0.227	3
		38.16 C	0.00	-1.84	1.36
37	ST W8X 31	PASS	AISC- H1-2	0.227	3
		38.16 C	0.00	-1.84	0.00
38	ST W8X 31	PASS	AISC- H1-2	0.429	3
		37.79 C	0.00	-12.92	1.57
39	ST W8X 31	PASS	AISC- H1-2	0.467	3
		45.29 C	0.00	12.92	0.00
40	ST W8X 31	PASS	AISC- H1-2	0.653	3
		46.99 C	0.00	22.60	1.57
41	ST W8X 31	PASS	AISC- H1-2	0.717	3
		47.78 C	0.00	25.83	1.57
42	ST W8X 31	PASS	AISC- H1-2	0.717	3
		47.78 C	0.00	-25.83	0.00

***** END OF TABULATED RESULT OF DESIGN *****

49. PLOT DISPLACEMENT FILE

50. PLOT BENDING FILE

51. FINISH

***** END OF STAAD-III *****

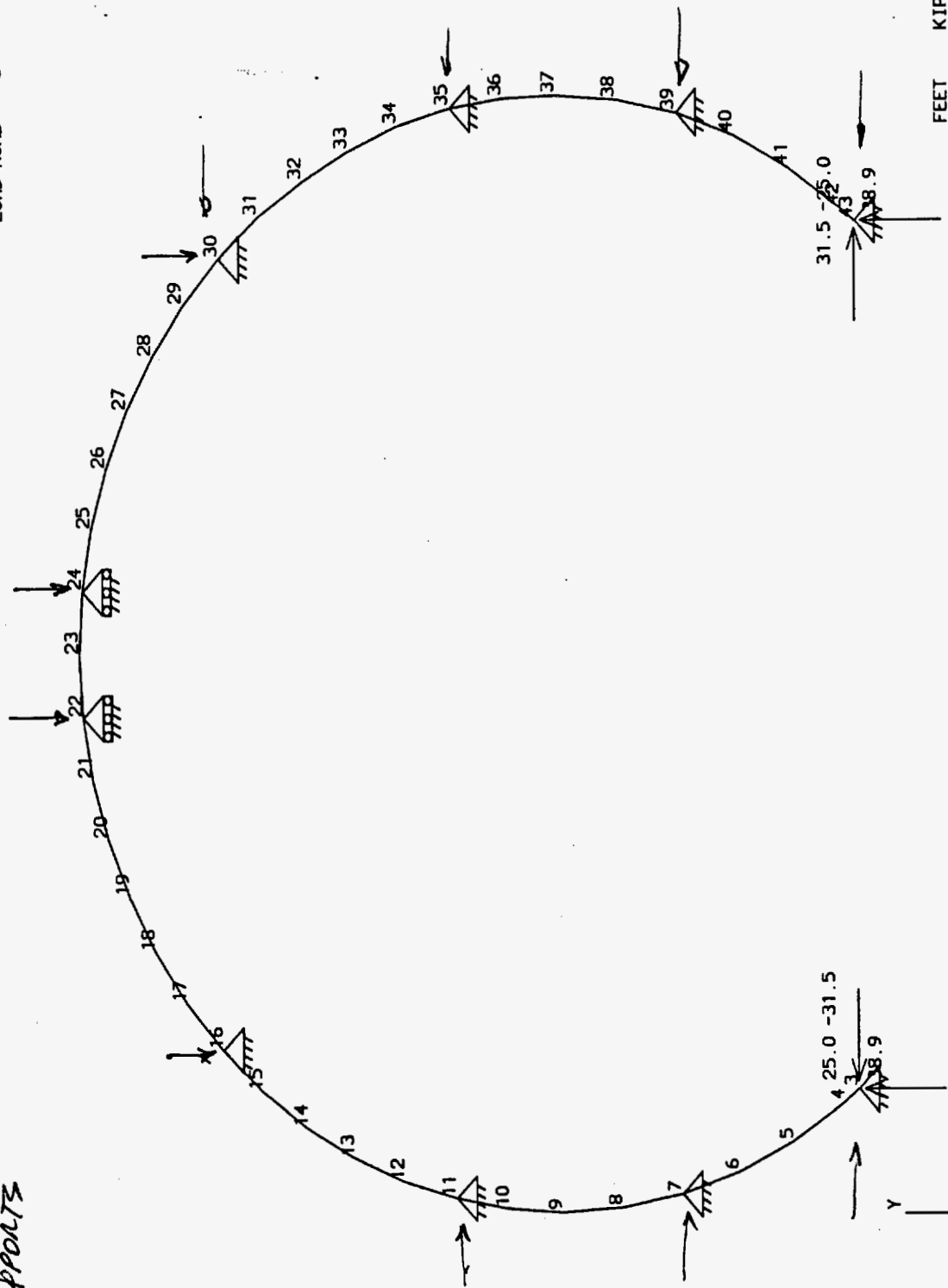
DATE= JUL 18,1995 TIME= 9: 2: 5 *****

* For questions on STAAD-III/ISDS, contact: *

* RESEARCH ENGINEERS, Inc at (714) 974-2500 *

LOAD NUMB= 3

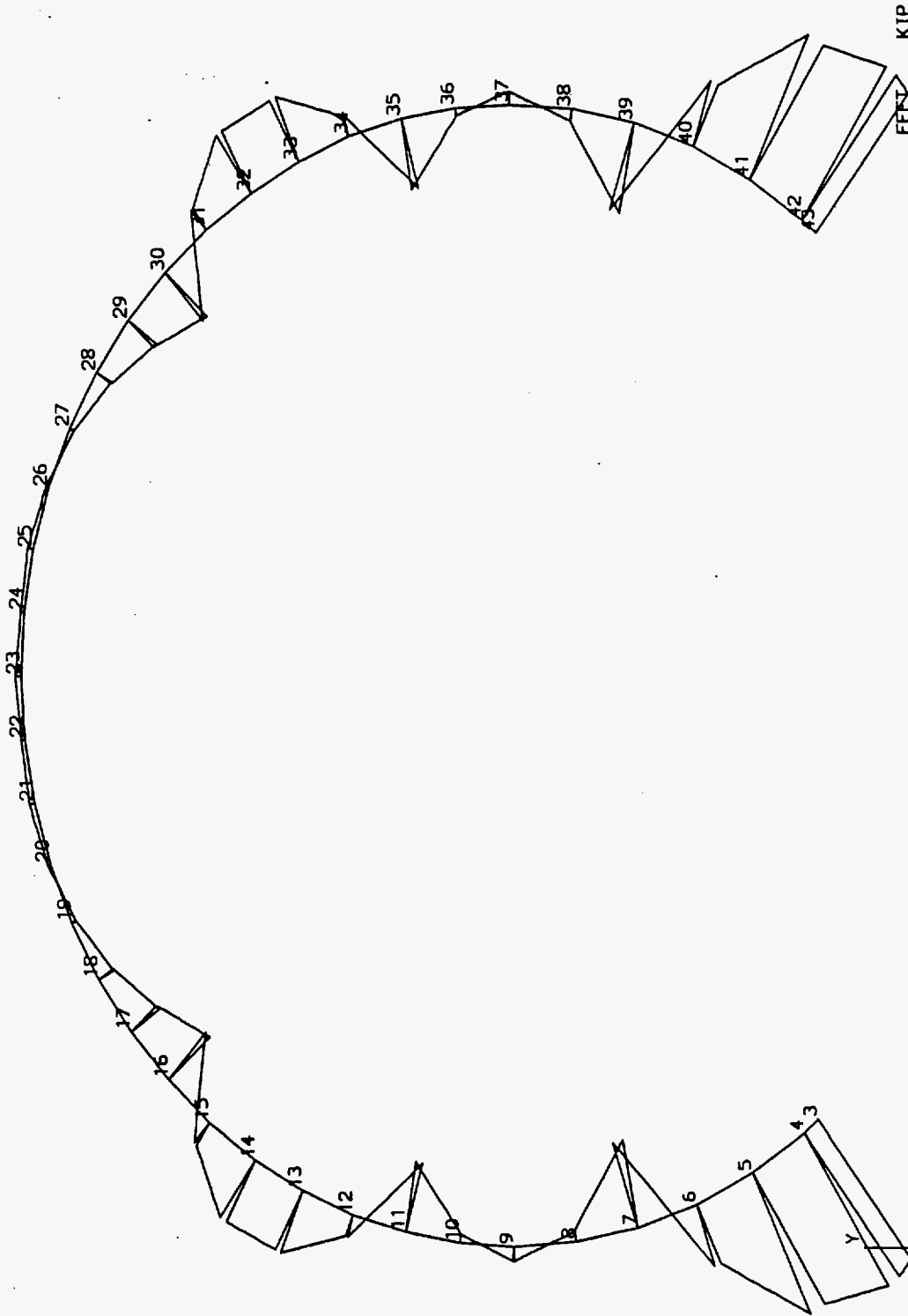
1 SUPPORTS



STAAD PL - PLOT (REVISION 16.0) STREV 3D
 TITLE: BABEE0000-01717-0200-00003 ATTACHMENT
 STRUCTURE DATA NJ= 41, NM= 40, NE= 0

COMPANY: M80
 DATE: JUL 18, 1995

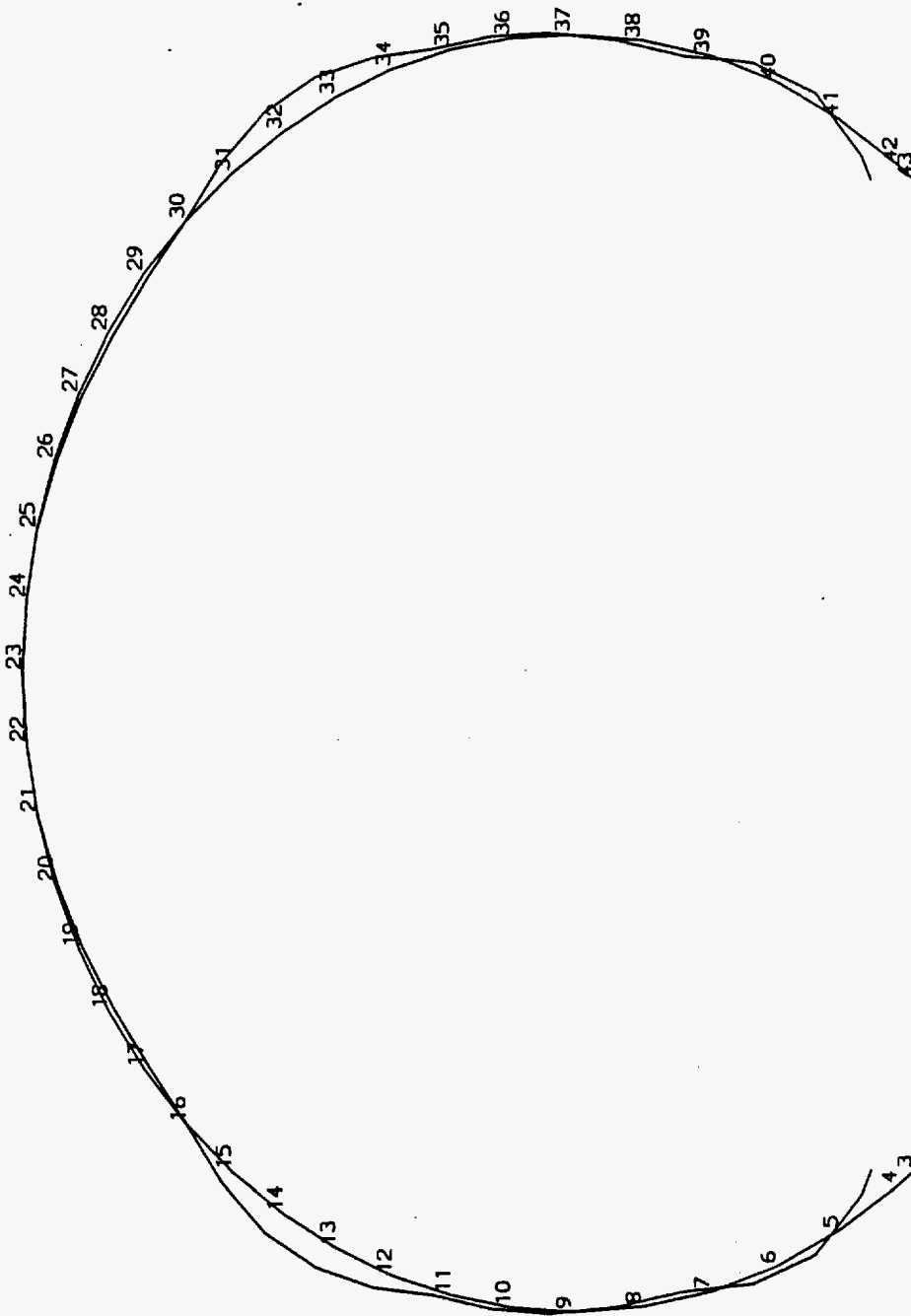
MOMENT MZ LN= 3



STADPL - PLOT (REVISION 16.0) STZRV 3D
 TITLE: BABEE0000-01717-0200-00003 ATTACHMENT
 STRUCTURE DATA NJ= 41, NW= 40, NE= 0

COMPANY: M&O
 DATE: JUL 18, 1995

DFDR LOAD= 3



FEET KIP

STAAD PL - PLOT (REVISION 16.0) STLRV 3D
 TITLE: BABEE0000-01717-0200-00003 ATTACHMENT
 STRUCTURE DATA NJ= 41, NM= 40, NE= 0

COMPANY: M&O
 DATE: JUL 18, 1995


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*****
*
*           S T A A D - III
*           Revision 16.0b
*           Proprietary Program of
*           RESEARCH ENGINEERS, Inc.
*           Date=      JUL 18, 1995
*           Time=      10:10:59
*
*****

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1. STAAD PLANE  BABEE0000-01717-0200-00003 ATTACHMENT  I
2. * ESF GROUND SUPPORT-STRUCTURAL STEEL ANALYSIS REV 00
3. * FILE STLRV3B
4. * 25 TON JACKS APPLIED BOTH SIDES @ 47 DEGREES
5. * MOMENT MZ RELEASED AT THE ENDS OF MEMBERS 15 AND 29
6. * MOMENT MZ RELEASED AT THE START OF MEMBERS 16 AND 30
7. UNIT FT KIP
8. JOINT COORDINATES
9. 3 3.27 2.13 ; 4 2.43 3.13
10. 5 1.58 4.44 ; 6 0.90 5.85 ; 7 0.40 7.33 ; 8 0.10 8.87
11. 9 0.0 10.43 ; 10 0.08 11.79 ; 11 0.31 13.14 ; 12 0.68 14.45
12. 13 1.21 15.71 ; 14 1.86 16.90 ; 15 2.65 18.02 ; 16 3.56 19.03
13. 17 4.58 19.94 ; 18 5.69 20.73 ; 19 6.89 21.39 ; 20 8.15 21.91
14. 21 9.46 22.29 ; 22 10.80 22.52 ; 23 12.17 22.60 ; 24 13.53 22.52
15. 25 14.87 22.29 ; 26 16.18 21.91 ; 27 17.45 21.39 ; 28 18.64 20.73
16. 29 19.75 19.94 ; 30 20.77 19.03 ; 31 21.68 18.02 ; 32 22.47 16.90
17. 33 23.13 15.71 ; 34 23.65 14.45 ; 35 24.03 13.14 ; 36 24.26 11.79
18. 37 24.33 10.43 ; 38 24.23 8.87 ; 39 23.93 7.33 ; 40 23.44 5.85
19. 41 22.76 4.44 ; 42 21.90 3.13 ; 43 21.06 2.13
20. MEMBER INCIDENCE
21. 3 3 4 42
22. UNIT KIP INCH
23. MEMBER RELEASE
24. 15 29 END MZ
25. 16 30 START MZ
26. MEMBER PROPERTIES
27. 3 TO 42 TA STA W8X31
28. CONSTANTS
29. E 29000.0 ALL
30. DENSITY 0.00028 ALL
31. BETA 0 ALL
32. UNIT FT
33. SUPPORT
34. 3 7 11 35 39 43 FIXED BUT FY MZ
35. 22 24 FIXED BUT FX MZ
36. 16 30 PINNED
37. UNIT KIP
38. LOAD 1
39. SELF WEIGHT Y -1.0
40. LOADING 2
41. * 25 TON JACKS & SIMULTANEOUS JACKING
42. JOINT LOADING
43. 3 FX -34.10
44. 43 FX 34.10
45. 3 FY 36.57
46. 43 FY 36.57
47. 43 MZ -25.00

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48. 3 MZ 25.00
49. LOADING COMBINATION 3
50. 1 2.5 2 1.0
51. PERFORM ANALYSIS

P R O B L E M S T A T I S T I C S

NUMBER OF JOINTS/MEMBER+ELEMENTS/SUPPORTS = 41/ 40/ 10
ORIGINAL/FINAL BAND-WIDTH = 1/ 1
TOTAL PRIMARY LOAD CASES = 2, TOTAL DEGREES OF FREEDOM = 111
SIZE OF STIFFNESS MATRIX = 666 DOUBLE PREC. WORDS
TOTAL REQUIRED DISK SPACE = 0.07 MEGA-BYTES

++ PROCESSING ELEMENT STIFFNESS MATRIX.	10:11: 2
++ PROCESSING GLOBAL STIFFNESS MATRIX.	10:11: 3
++ PROCESSING TRIANGULAR FACTORIZATION.	10:11: 3
++ CALCULATING JOINT DISPLACEMENTS.	10:11: 3
++ CALCULATING MEMBER FORCES.	10:11: 4

52. LOAD LIST 3
53. PRINT ANALYSIS RESULTS

JOINT DISPLACEMENT (INCH RADIANS)

STRUCTURE TYPE = PLANE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
3	3	0.00000	0.06910	0.00000	0.00000	0.00000	0.00342
4	3	-0.03097	0.03955	0.00000	0.00000	0.00000	0.00186
5	3	-0.04236	0.02831	0.00000	0.00000	0.00000	0.00008
6	3	-0.02702	0.03218	0.00000	0.00000	0.00000	-0.00100
7	3	0.00000	0.03808	0.00000	0.00000	0.00000	-0.00077
8	3	0.00352	0.03621	0.00000	0.00000	0.00000	-0.00011
9	3	0.00263	0.03360	0.00000	0.00000	0.00000	0.00003
10	3	0.00239	0.03141	0.00000	0.00000	0.00000	0.00013
11	3	0.00000	0.02960	0.00000	0.00000	0.00000	0.00056
12	3	-0.01765	0.03201	0.00000	0.00000	0.00000	0.00079
13	3	-0.03021	0.03454	0.00000	0.00000	0.00000	0.00030
14	3	-0.03095	0.03205	0.00000	0.00000	0.00000	-0.00050
15	3	-0.01909	0.02056	0.00000	0.00000	0.00000	-0.00127
16	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
17	3	0.00016	-0.00024	0.00000	0.00000	0.00000	-0.00001
18	3	0.00024	-0.00042	0.00000	0.00000	0.00000	-0.00001
19	3	0.00025	-0.00050	0.00000	0.00000	0.00000	0.00000
20	3	0.00019	-0.00043	0.00000	0.00000	0.00000	0.00001
21	3	0.00010	-0.00023	0.00000	0.00000	0.00000	0.00001
22	3	0.00003	0.00000	0.00000	0.00000	0.00000	0.00001
23	3	0.00000	0.00005	0.00000	0.00000	0.00000	0.00000
24	3	-0.00003	0.00000	0.00000	0.00000	0.00000	-0.00001
25	3	-0.00010	-0.00023	0.00000	0.00000	0.00000	-0.00001
26	3	-0.00019	-0.00043	0.00000	0.00000	0.00000	-0.00001
27	3	-0.00025	-0.00050	0.00000	0.00000	0.00000	0.00000
28	3	-0.00024	-0.00042	0.00000	0.00000	0.00000	0.00001
29	3	-0.00016	-0.00024	0.00000	0.00000	0.00000	0.00001
30	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
31	3	0.01907	0.02054	0.00000	0.00000	0.00000	0.00127
32	3	0.03093	0.03204	0.00000	0.00000	0.00000	0.00051
33	3	0.03030	0.03460	0.00000	0.00000	0.00000	-0.00030
34	3	0.01755	0.03208	0.00000	0.00000	0.00000	-0.00079
35	3	0.00000	0.02957	0.00000	0.00000	0.00000	-0.00056
36	3	-0.00244	0.03138	0.00000	0.00000	0.00000	-0.00014
37	3	-0.00291	0.03356	0.00000	0.00000	0.00000	-0.00004
38	3	-0.00377	0.03616	0.00000	0.00000	0.00000	0.00012
39	3	0.00000	0.03799	0.00000	0.00000	0.00000	0.00079
40	3	0.02749	0.03210	0.00000	0.00000	0.00000	0.00102
41	3	0.04292	0.02818	0.00000	0.00000	0.00000	-0.00009
42	3	0.03121	0.03975	0.00000	0.00000	0.00000	-0.00188
43	3	0.00000	0.06950	0.00000	0.00000	0.00000	-0.00344

ATTACHMENT I

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Title: ESF Ground Support - Structural Steel Analysis

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SUPPORT REACTIONS -UNIT KIP FEET STRUCTURE TYPE = PLANE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
3	3	6.37	0.00	0.00	0.00	0.00	0.00
7	3	27.80	0.00	0.00	0.00	0.00	0.00
11	3	21.31	0.00	0.00	0.00	0.00	0.00
35	3	-21.37	0.00	0.00	0.00	0.00	0.00
39	3	-27.81	0.00	0.00	0.00	0.00	0.00
43	3	-6.34	0.00	0.00	0.00	0.00	0.00
22	3	0.00	0.20	0.00	0.00	0.00	0.00
24	3	0.00	0.20	0.00	0.00	0.00	0.00
16	3	-20.92	-34.61	0.00	0.00	0.00	0.00
30	3	20.96	-34.61	0.00	0.00	0.00	0.00

MEMBER END FORCES STRUCTURE TYPE = PLANE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
3	3	3	45.84	2.29	0.00	0.00	0.00	-25.00
		4	-45.76	-2.22	0.00	0.00	0.00	27.95
4	3	4	45.69	-3.41	0.00	0.00	0.00	-27.95
		5	-45.59	3.48	0.00	0.00	0.00	22.57
5	3	5	44.79	-9.19	0.00	0.00	0.00	-22.57
		6	-44.68	9.24	0.00	0.00	0.00	8.15
6	3	6	43.20	-14.67	0.00	0.00	0.00	-8.15
		7	-43.09	14.71	0.00	0.00	0.00	-14.80
7	3	7	35.43	6.98	0.00	0.00	0.00	14.80
		8	-35.31	-6.95	0.00	0.00	0.00	-3.88
8	3	8	35.91	2.37	0.00	0.00	0.00	3.88
		9	-35.79	-2.37	0.00	0.00	0.00	-0.17
9	3	9	35.81	2.03	0.00	0.00	0.00	-0.17
		10	-35.71	-2.03	0.00	0.00	0.00	2.94
10	3	10	35.27	5.94	0.00	0.00	0.00	-2.94
		11	-35.17	-5.92	0.00	0.00	0.00	11.05
11	3	11	40.13	-10.89	0.00	0.00	0.00	-11.05
		12	-40.03	10.92	0.00	0.00	0.00	-3.79
12	3	12	41.07	-5.93	0.00	0.00	0.00	3.79
		13	-40.97	5.97	0.00	0.00	0.00	-11.92
13	3	13	41.36	-1.77	0.00	0.00	0.00	11.92
		14	-41.27	1.82	0.00	0.00	0.00	-14.35
14	3	14	41.21	2.90	0.00	0.00	0.00	14.35
		15	-41.13	-2.84	0.00	0.00	0.00	-10.42
15	3	15	40.50	7.70	0.00	0.00	0.00	10.42
		16	-40.42	-7.63	0.00	0.00	0.00	0.00
16	3	16	0.70	0.09	0.00	0.00	0.00	0.00
		17	-0.63	-0.01	0.00	0.00	0.00	0.07
17	3	17	0.62	0.08	0.00	0.00	0.00	-0.07
		18	-0.56	0.01	0.00	0.00	0.00	0.12
18	3	18	0.56	0.06	0.00	0.00	0.00	-0.12
		19	-0.51	0.03	0.00	0.00	0.00	0.13

MEMBER END FORCES STRUCTURE TYPE = PLANE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
36	3	36	35.72	-1.78	0.00	0.00	0.00	-2.80
		37	-35.83	1.79	0.00	0.00	0.00	0.37
37	3	37	35.79	-2.35	0.00	0.00	0.00	0.37
		38	-35.91	2.36	0.00	0.00	0.00	-4.05
38	3	38	35.32	-6.94	0.00	0.00	0.00	4.05
		39	-35.43	6.96	0.00	0.00	0.00	-14.95
39	3	39	43.00	15.00	0.00	0.00	0.00	14.95
		40	-43.12	-14.96	0.00	0.00	0.00	8.41
40	3	40	44.69	9.26	0.00	0.00	0.00	-8.41
		41	-44.80	-9.21	0.00	0.00	0.00	22.87
41	3	41	45.62	3.26	0.00	0.00	0.00	-22.87
		42	-45.72	-3.19	0.00	0.00	0.00	27.92
42	3	42	45.78	-2.20	0.00	0.00	0.00	-27.92
		43	-45.86	2.27	0.00	0.00	0.00	25.00

***** END OF LATEST ANALYSIS RESULT *****

54. CHECK CODE ALL

STAAD-III CODE CHECKING - (AISC)

ALL UNITS ARE - KIP FEET (UNLESS OTHERWISE NOTED)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
=====					
3	ST W8X 31	PASS	AISC- H1-2	0.745	3
		45.76 C	0.00	27.95	1.31
4	ST W8X 31	PASS	AISC- H1-2	0.745	3
		45.69 C	0.00	-27.95	0.00
5	ST W8X 31	PASS	AISC- H1-2	0.642	3
		44.79 C	0.00	-22.57	0.00
6	ST W8X 31	PASS	AISC- H1-2	0.490	3
		43.09 C	0.00	-14.80	1.56
7	ST W8X 31	PASS	AISC- H1-2	0.452	3
		35.43 C	0.00	14.80	0.00
8	ST W8X 31	PASS	AISC- H1-2	0.253	3
		35.91 C	0.00	3.88	0.00
9	ST W8X 31	PASS	AISC- H1-2	0.235	3
		35.71 C	0.00	2.94	1.36
10	ST W8X 31	PASS	AISC- H1-2	0.381	3
		35.17 C	0.00	11.05	1.37
11	ST W8X 31	PASS	AISC- H1-2	0.407	3
		40.13 C	0.00	-11.05	0.00
12	ST W8X 31	PASS	AISC- H1-2	0.427	3
		40.97 C	0.00	-11.92	1.37
13	ST W8X 31	PASS	AISC- H1-2	0.473	3
		41.27 C	0.00	-14.35	1.36
14	ST W8X 31	PASS	AISC- H1-2	0.473	3
		41.21 C	0.00	14.35	0.00
15	ST W8X 31	PASS	AISC- H1-2	0.397	3
		40.50 C	0.00	10.42	0.00
16	ST W8X 31	PASS	AISC- H1-3	0.004	3
		0.63 C	0.00	0.07	1.37
17	ST W8X 31	PASS	AISC- H1-3	0.005	3
		0.56 C	0.00	0.12	1.36
18	ST W8X 31	PASS	AISC- H1-3	0.005	3
		0.56 C	0.00	-0.12	0.00
19	ST W8X 31	PASS	AISC- H1-3	0.005	3
		0.51 C	0.00	-0.13	0.00
20	ST W8X 31	PASS	AISC- H1-3	0.004	3
		0.48 C	0.00	-0.10	0.00
21	ST W8X 31	PASS	AISC- H1-3	0.005	3
		0.44 C	0.00	-0.16	1.36
22	ST W8X 31	PASS	AISC- H1-3	0.005	3
		0.47 C	0.00	0.16	0.00
23	ST W8X 31	PASS	AISC- H1-3	0.005	3
		0.47 C	0.00	-0.16	1.36
24	ST W8X 31	PASS	AISC- H1-3	0.005	3
		0.44 C	0.00	0.16	0.00
25	ST W8X 31	PASS	AISC- H1-3	0.004	3
		0.48 C	0.00	0.10	1.36
26	ST W8X 31	PASS	AISC- H1-3	0.005	3
		0.51 C	0.00	0.13	1.37

L UNITS ARE - KIP FEET (UNLESS OTHERWISE NOTED)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
27	ST W8X 31	PASS	AISC- H1-3	0.005	3
		0.51 C	0.00	-0.13	0.00
28	ST W8X 31	PASS	AISC- H1-3	0.005	3
		0.56 C	0.00	-0.12	0.00
29	ST W8X 31	PASS	AISC- H1-3	0.004	3
		0.63 C	0.00	-0.07	0.00
30	ST W8X 31	PASS	AISC- H1-2	0.396	3
		40.52 C	0.00	-10.38	1.36
31	ST W8X 31	PASS	AISC- H1-2	0.471	3
		41.23 C	0.00	-14.27	1.37
32	ST W8X 31	PASS	AISC- H1-2	0.471	3
		41.30 C	0.00	14.27	0.00
33	ST W8X 31	PASS	AISC- H1-2	0.430	3
		40.94 C	0.00	12.13	0.00
34	ST W8X 31	PASS	AISC- H1-2	0.405	3
		40.22 C	0.00	10.94	1.36
35	ST W8X 31	PASS	AISC- H1-2	0.379	3
		35.16 C	0.00	-10.94	0.00
36	ST W8X 31	PASS	AISC- H1-2	0.233	3
		35.72 C	0.00	-2.80	0.00
37	ST W8X 31	PASS	AISC- H1-2	0.256	3
		35.91 C	0.00	-4.05	1.56
38	ST W8X 31	PASS	AISC- H1-2	0.454	3
		35.43 C	0.00	-14.95	1.57
39	ST W8X 31	PASS	AISC- H1-2	0.493	3
		43.00 C	0.00	14.95	0.00
40	ST W8X 31	PASS	AISC- H1-2	0.647	3
		44.80 C	0.00	22.87	1.57
41	ST W8X 31	PASS	AISC- H1-2	0.745	3
		45.72 C	0.00	27.92	1.57
42	ST W8X 31	PASS	AISC- H1-2	0.745	3
		45.78 C	0.00	-27.92	0.00

***** END OF TABULATED RESULT OF DESIGN *****

55. PLOT DISPLACEMENT FILE

56. PLOT BENDING FILE

57. FINISH

***** END OF STAAD-III *****

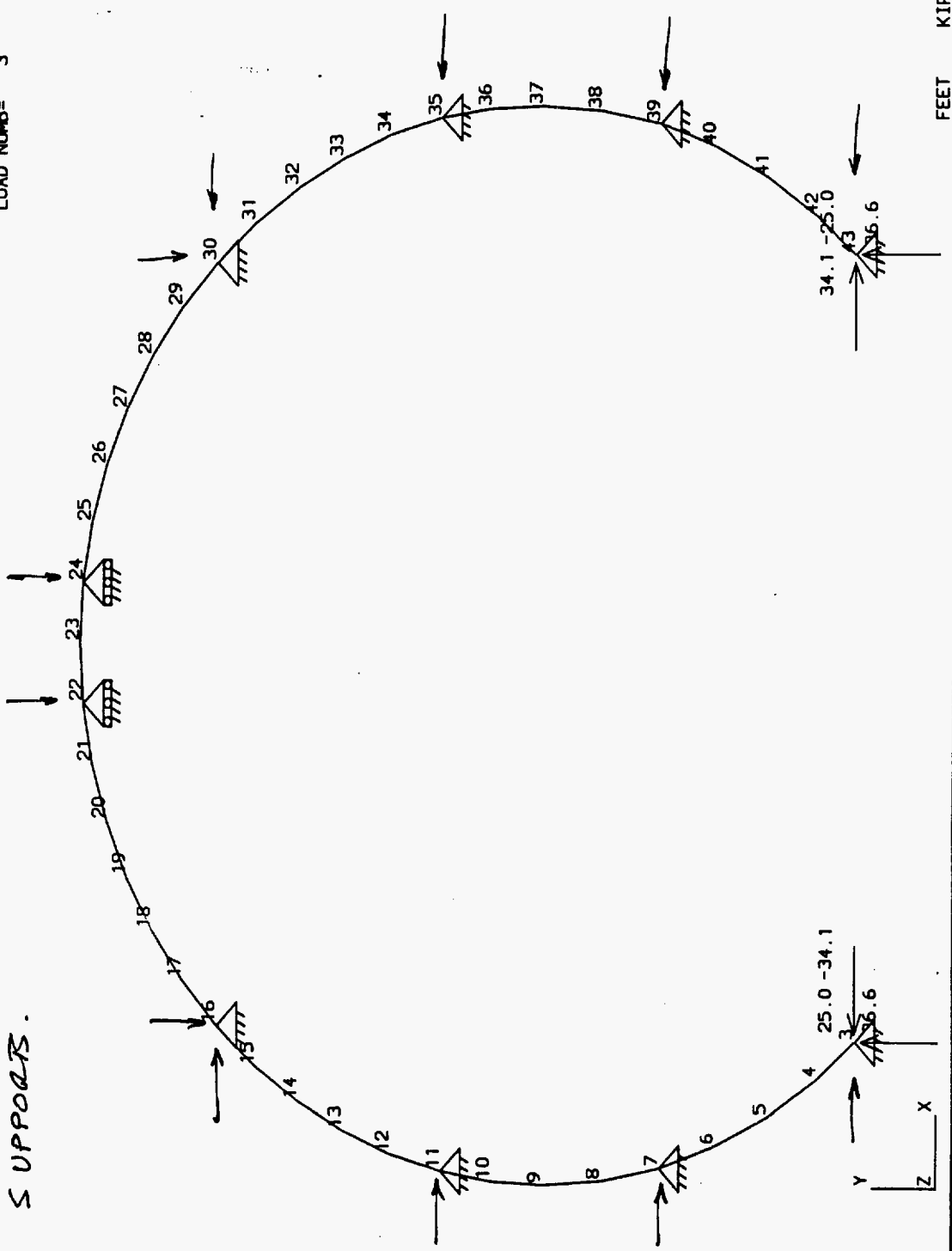
DATE= JUL 18,1995 TIME= 10:11: 7 *****

* For questions on STAAD-III/ISDS, contact: *

* RESEARCH ENGINEERS, Inc at (714) 974-2500 *

LOAD NUMB= 3

SUPPORTS.

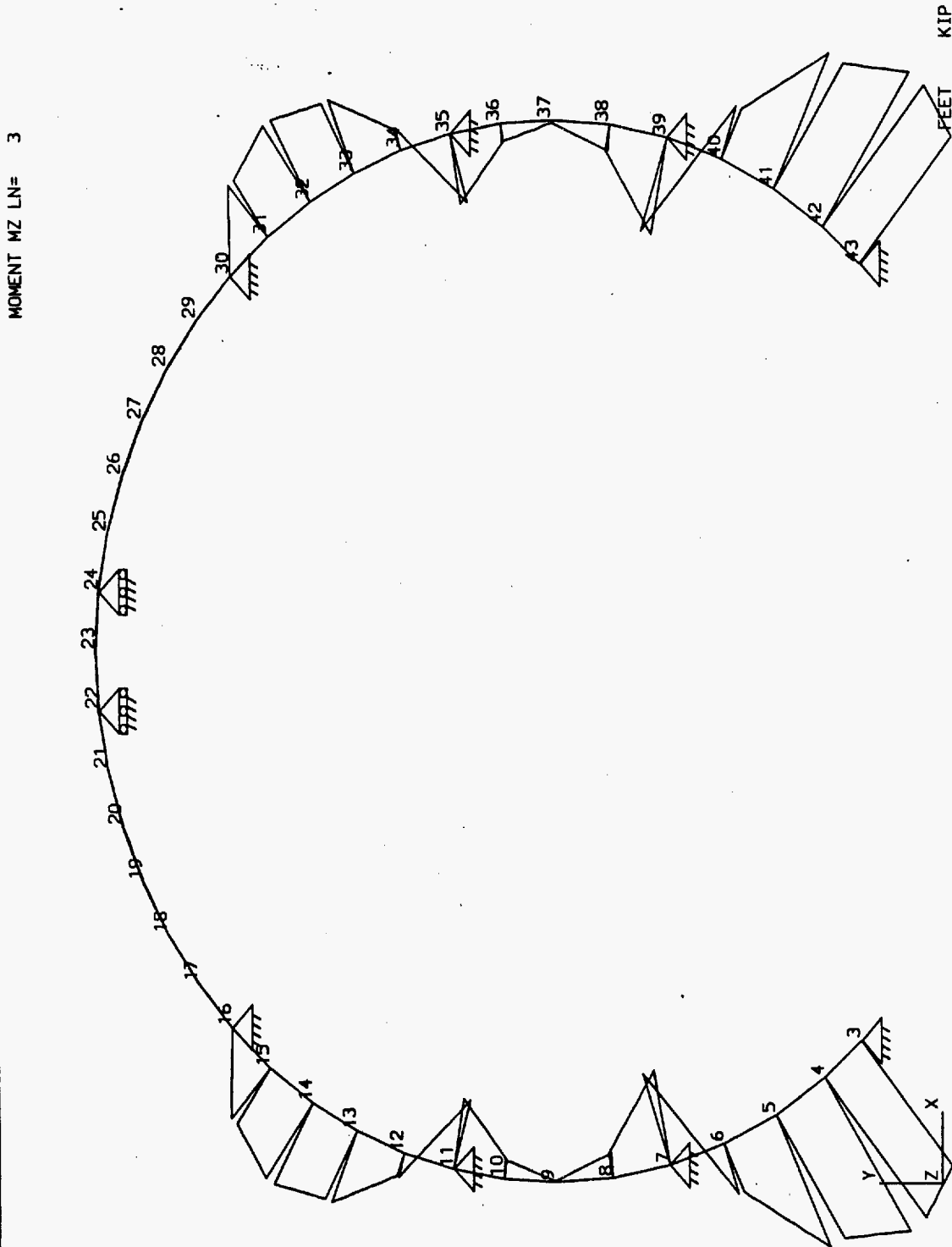


FEET KIP

STADPL - PLOT (REVISION 16.0) STLRV 3B

TITLE: BABEE0000-01717-0200-00003 ATTACHMENT I
STRUCTURE DATA NJ= 41, NM= 40, NE= 0

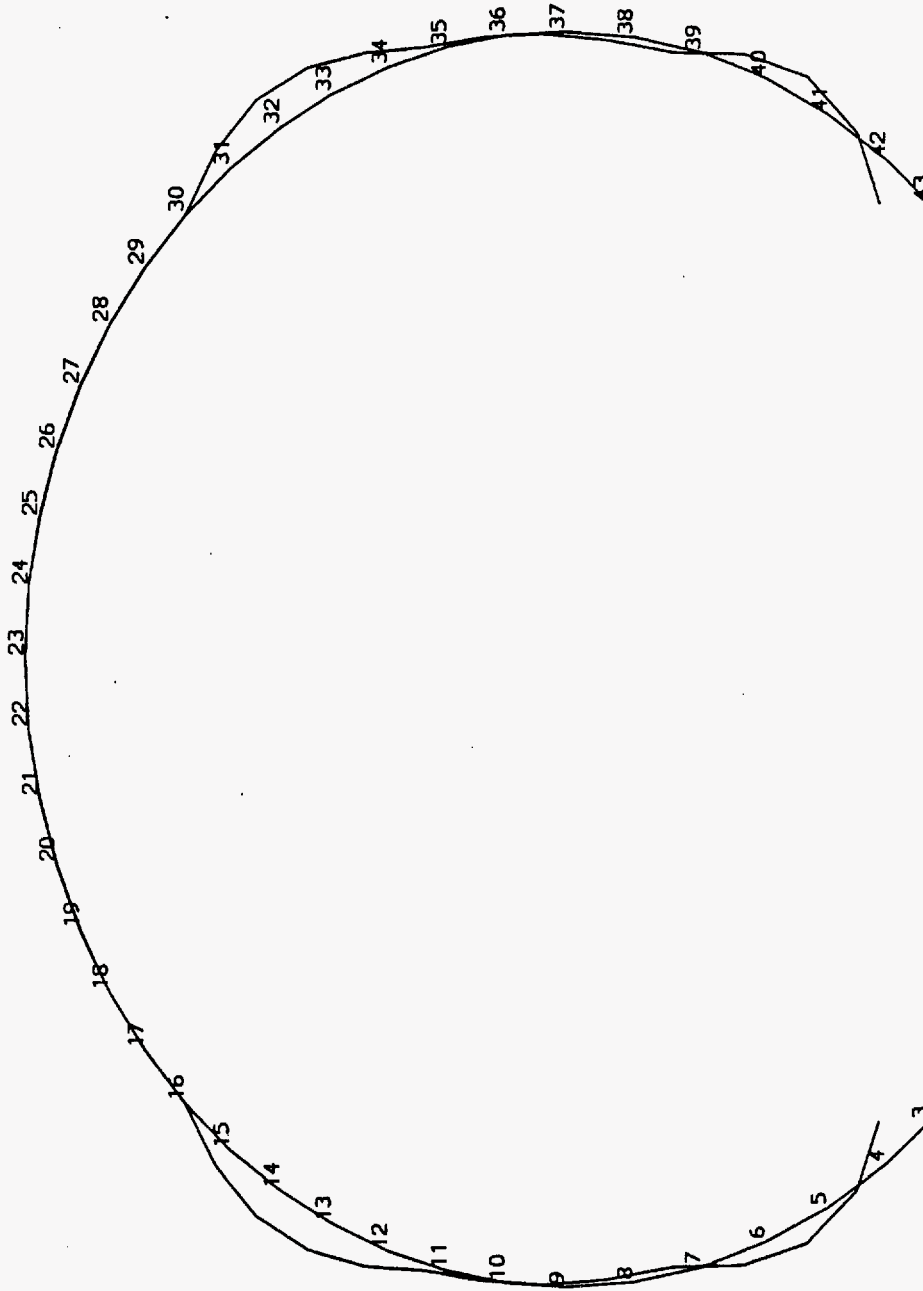
COMPANY: M&O
DATE: JUL 18, 1995



STAAD PL - PLOT (REVISION 16.0) STLRV 3B
 TITLE: BABEE0000-01717-0200-00003 ATTACHMENT I
 STRUCTURE DATA NJ= 41, NM= 40, NE= 0

COMPANY: M&O
 DATE: JUL 18, 1995

DFDR LOAD= 3



FEET KIP

STADPL - PLOT (REVISION 16.0) STLRV 3B
 TITLE: BABEE0000-01717-0200-00003 ATTACHMENT I
 STRUCTURE DATA NJ= 41, NM= 40, NE= 0

COMPANY: M&O
 DATE: JUL 18, 1995

```
*****
*
*           S T A A D - III
*           Revision 16.0b
*           Proprietary Program of
*           RESEARCH ENGINEERS, Inc.
*           Date=      JUL 18, 1995
*           Time=      10:20:35
*
*****
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1. STAAD PLANE  BABEE0000-01717-0200-00003  ATTACHMENT I
2. * ESF GROUND SUPPORT-STRUCTURAL STEEL ANALYSIS  REV 00
3. * FILE STL RV3C
4. * 25 TON JACKS APPLIED BOTH SIDES @ 49 DEGREES
5. * MOMENT MZ RELEASED AT THE END OF MEMBERS 15 & 29
6. * MOMENT MZ RELEASED AT THE START OF MEMBERS 16 & 30
7. UNIT FT KIP
8. JOINT COORDINATES
9. 3 2.98 2.45 ; 4 2.43 3.13
10. 5 1.58 4.44 ; 6 0.90 5.85 ; 7 0.40 7.33 ; 8 0.10 8.87
11. 9 0.0 10.43 ; 10 0.08 11.79 ; 11 0.31 13.14 ; 12 0.68 14.45
12. 13 1.21 15.71 ; 14 1.86 16.90 ; 15 2.65 18.02 ; 16 3.56 19.03
13. 17 4.58 19.94 ; 18 5.69 20.73 ; 19 6.89 21.39 ; 20 8.15 21.91
14. 21 9.46 22.29 ; 22 10.80 22.52 ; 23 12.17 22.60 ; 24 13.53 22.52
15. 25 14.87 22.29 ; 26 16.18 21.91 ; 27 17.45 21.39 ; 28 18.64 20.73
16. 29 19.75 19.94 ; 30 20.77 19.03 ; 31 21.68 18.02 ; 32 22.47 16.90
17. 33 23.13 15.71 ; 34 23.65 14.45 ; 35 24.03 13.14 ; 36 24.26 11.79
18. 37 24.33 10.43 ; 38 24.23 8.87 ; 39 23.93 7.33 ; 40 23.44 5.85
19. 41 22.76 4.44 ; 42 21.90 3.13 ; 43 21.35 2.45
20. MEMBER INCIDENCE
21. 3 3 4 42
22. UNIT KIP INCH
23. MEMBER RELEASE
24. 15 29 END MZ
25. 16 30 START MZ
26. MEMBER PROPERTIES
27. 3 TO 42 TA STA W8X31
28. CONSTANTS
29. E 29000.0 ALL
30. DENSITY 0.00028 ALL
31. BETA 0 ALL
32. UNIT FT
33. SUPPORT
34. 3 7 11 35 39 43 FIXED BUT FY MZ
35. 22 24 FIXED BUT FX MZ
36. 16 30 PINNED
37. UNIT KIP
38. LOAD 1
39. SELF WEIGHT Y -1.0
40. LOADING 2
41. * 25 TON JACKS & SIMULTANEOUS JACKING
42. JOINT LOADING
43. 3 FX -32.8
44. 43 FX 32.8
45. 3 FY 37.74
46. 43 FY 37.74
47. 43 MZ -25.00
```

Title: ESF Ground Support - Structural Steel AnalysisPage: I - 84 of I-174

48. 3 MZ 25.00
49. LOADING COMBINATION 3
50. 1 2.5 2 1.0
51. PERFORM ANALYSIS

P R O B L E M S T A T I S T I C S

NUMBER OF JOINTS/MEMBER+ELEMENTS/SUPPORTS = 41/ 40/ 10
ORIGINAL/FINAL BAND-WIDTH = 1/ 1
TOTAL PRIMARY LOAD CASES = 2, TOTAL DEGREES OF FREEDOM = 111
SIZE OF STIFFNESS MATRIX = 666 DOUBLE PREC. WORDS
TOTAL REQUIRED DISK SPACE = 0.07 MEGA-BYTES

++ PROCESSING ELEMENT STIFFNESS MATRIX.	10:20:38
++ PROCESSING GLOBAL STIFFNESS MATRIX.	10:20:39
++ PROCESSING TRIANGULAR FACTORIZATION.	10:20:39
++ CALCULATING JOINT DISPLACEMENTS.	10:20:39
++ CALCULATING MEMBER FORCES.	10:20:40

52. LOAD LIST 3
53. PRINT ANALYSIS RESULTS

JOINT DISPLACEMENT (INCH RADIANS)

STRUCTURE TYPE = PLANE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
3	3	0.00000	0.06548	0.00000	0.00000	0.00000	0.00307
4	3	-0.02030	0.04668	0.00000	0.00000	0.00000	0.00205
5	3	-0.03527	0.03303	0.00000	0.00000	0.00000	0.00031
6	3	-0.02385	0.03493	0.00000	0.00000	0.00000	-0.00080
7	3	0.00000	0.03968	0.00000	0.00000	0.00000	-0.00064
8	3	0.00203	0.03742	0.00000	0.00000	0.00000	-0.00006
9	3	0.00112	0.03473	0.00000	0.00000	0.00000	0.00002
10	3	0.00161	0.03242	0.00000	0.00000	0.00000	0.00009
11	3	0.00000	0.03040	0.00000	0.00000	0.00000	0.00055
12	3	-0.01788	0.03279	0.00000	0.00000	0.00000	0.00080
13	3	-0.03076	0.03536	0.00000	0.00000	0.00000	0.00031
14	3	-0.03162	0.03283	0.00000	0.00000	0.00000	-0.00051
15	3	-0.01954	0.02107	0.00000	0.00000	0.00000	-0.00130
16	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
17	3	0.00016	-0.00024	0.00000	0.00000	0.00000	-0.00001
18	3	0.00024	-0.00042	0.00000	0.00000	0.00000	-0.00001
19	3	0.00025	-0.00050	0.00000	0.00000	0.00000	0.00000
20	3	0.00019	-0.00043	0.00000	0.00000	0.00000	0.00001
21	3	0.00010	-0.00023	0.00000	0.00000	0.00000	0.00001
22	3	0.00003	0.00000	0.00000	0.00000	0.00000	0.00001
23	3	0.00000	0.00005	0.00000	0.00000	0.00000	0.00000
24	3	-0.00003	0.00000	0.00000	0.00000	0.00000	-0.00001
25	3	-0.00010	-0.00023	0.00000	0.00000	0.00000	-0.00001
26	3	-0.00019	-0.00043	0.00000	0.00000	0.00000	-0.00001
27	3	-0.00025	-0.00050	0.00000	0.00000	0.00000	0.00000
28	3	-0.00024	-0.00042	0.00000	0.00000	0.00000	0.00001
29	3	-0.00016	-0.00024	0.00000	0.00000	0.00000	0.00001
30	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
31	3	0.01951	0.02105	0.00000	0.00000	0.00000	0.00130
32	3	0.03160	0.03282	0.00000	0.00000	0.00000	0.00051
33	3	0.03086	0.03543	0.00000	0.00000	0.00000	-0.00031
34	3	0.01777	0.03286	0.00000	0.00000	0.00000	-0.00080
35	3	0.00000	0.03038	0.00000	0.00000	0.00000	-0.00055
36	3	-0.00166	0.03239	0.00000	0.00000	0.00000	-0.00010
37	3	-0.00141	0.03468	0.00000	0.00000	0.00000	-0.00002
38	3	-0.00229	0.03737	0.00000	0.00000	0.00000	0.00007
39	3	0.00000	0.03958	0.00000	0.00000	0.00000	0.00066
40	3	0.02432	0.03482	0.00000	0.00000	0.00000	0.00082
41	3	0.03581	0.03288	0.00000	0.00000	0.00000	-0.00031
42	3	0.02048	0.04691	0.00000	0.00000	0.00000	-0.00207
43	3	0.00000	0.06587	0.00000	0.00000	0.00000	-0.00309

ATTACHMENT I

DI: BABEE0000-01717-0200-00003 REV 02

Title: ESF Ground Support - Structural Steel Analysis

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SUPPORT REACTIONS -UNIT KIP FEET STRUCTURE TYPE = PLANE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
3	3	5.06	0.00	0.00	0.00	0.00	0.00
7	3	27.44	0.00	0.00	0.00	0.00	0.00
11	3	22.48	0.00	0.00	0.00	0.00	0.00
35	3	-22.54	0.00	0.00	0.00	0.00	0.00
39	3	-27.45	0.00	0.00	0.00	0.00	0.00
43	3	-5.03	0.00	0.00	0.00	0.00	0.00
22	3	0.00	0.20	0.00	0.00	0.00	0.00
24	3	0.00	0.20	0.00	0.00	0.00	0.00
16	3	-21.71	-35.81	0.00	0.00	0.00	0.00
30	3	21.75	-35.81	0.00	0.00	0.00	0.00

MEMBER END FORCES STRUCTURE TYPE = PLANE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
3	3	3	46.79	2.16	0.00	0.00	0.00	-25.00
		4	-46.74	-2.12	0.00	0.00	0.00	26.87
4	3	4	46.70	-2.77	0.00	0.00	0.00	-26.87
		5	-46.60	2.83	0.00	0.00	0.00	22.50
5	3	5	45.88	-8.68	0.00	0.00	0.00	-22.50
		6	-45.77	8.73	0.00	0.00	0.00	8.88
6	3	6	44.34	-14.30	0.00	0.00	0.00	-8.88
		7	-44.23	14.34	0.00	0.00	0.00	-13.49
7	3	7	36.68	6.84	0.00	0.00	0.00	13.49
		8	-36.56	-6.82	0.00	0.00	0.00	-2.78
8	3	8	37.14	2.08	0.00	0.00	0.00	2.78
		9	-37.02	-2.07	0.00	0.00	0.00	0.47
9	3	9	36.99	2.48	0.00	0.00	0.00	0.47
		10	-36.89	-2.47	0.00	0.00	0.00	2.90
10	3	10	36.39	6.50	0.00	0.00	0.00	-2.90
		11	-36.29	-6.49	0.00	0.00	0.00	11.80
11	3	11	41.50	-11.32	0.00	0.00	0.00	-11.80
		12	-41.40	11.35	0.00	0.00	0.00	-3.63
12	3	12	42.48	-6.19	0.00	0.00	0.00	3.63
		13	-42.39	6.23	0.00	0.00	0.00	-12.12
13	3	13	42.80	-1.89	0.00	0.00	0.00	12.12
		14	-42.71	1.94	0.00	0.00	0.00	-14.72
14	3	14	42.65	2.95	0.00	0.00	0.00	14.72
		15	-42.56	-2.89	0.00	0.00	0.00	-10.72
15	3	15	41.92	7.92	0.00	0.00	0.00	10.72
		16	-41.84	-7.85	0.00	0.00	0.00	0.00
16	3	16	0.70	0.09	0.00	0.00	0.00	0.00
		17	-0.63	-0.01	0.00	0.00	0.00	0.07
17	3	17	0.62	0.08	0.00	0.00	0.00	-0.07
		18	-0.56	0.01	0.00	0.00	0.00	0.12
18	3	18	0.56	0.06	0.00	0.00	0.00	-0.12
		19	-0.51	0.03	0.00	0.00	0.00	0.13

MEMBER END FORCES STRUCTURE TYPE = PLANE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
19	3	19	0.51	0.02	0.00	0.00	0.00	-0.13
		20	-0.47	0.07	0.00	0.00	0.00	0.10
20	3	20	0.48	-0.02	0.00	0.00	0.00	-0.10
		21	-0.45	0.12	0.00	0.00	0.00	0.00
21	3	21	0.46	-0.07	0.00	0.00	0.00	0.00
		22	-0.44	0.17	0.00	0.00	0.00	-0.16
22	3	22	0.47	0.08	0.00	0.00	0.00	0.16
		23	-0.46	0.03	0.00	0.00	0.00	-0.13
23	3	23	0.46	0.03	0.00	0.00	0.00	0.13
		24	-0.47	0.08	0.00	0.00	0.00	-0.16
24	3	24	0.44	0.17	0.00	0.00	0.00	0.16
		25	-0.46	-0.07	0.00	0.00	0.00	0.00
25	3	25	0.45	0.12	0.00	0.00	0.00	0.00
		26	-0.48	-0.02	0.00	0.00	0.00	0.10
26	3	26	0.47	0.07	0.00	0.00	0.00	-0.10
		27	-0.51	0.03	0.00	0.00	0.00	0.13
27	3	27	0.51	0.03	0.00	0.00	0.00	-0.13
		28	-0.56	0.06	0.00	0.00	0.00	0.12
28	3	28	0.56	0.01	0.00	0.00	0.00	-0.12
		29	-0.62	0.08	0.00	0.00	0.00	0.07
29	3	29	0.63	-0.01	0.00	0.00	0.00	-0.07
		30	-0.70	0.09	0.00	0.00	0.00	0.00
30	3	30	41.87	-7.82	0.00	0.00	0.00	0.00
		31	-41.95	7.89	0.00	0.00	0.00	-10.68
31	3	31	42.59	-2.85	0.00	0.00	0.00	10.68
		32	-42.67	2.91	0.00	0.00	0.00	-14.63
32	3	32	42.74	1.70	0.00	0.00	0.00	14.63
		33	-42.83	-1.65	0.00	0.00	0.00	-12.34
33	3	33	42.36	6.55	0.00	0.00	0.00	12.34
		34	-42.45	-6.51	0.00	0.00	0.00	-3.44
34	3	34	41.49	11.10	0.00	0.00	0.00	3.44
		35	-41.59	-11.07	0.00	0.00	0.00	11.68
35	3	35	36.29	-6.51	0.00	0.00	0.00	-11.68
		36	-36.39	6.52	0.00	0.00	0.00	2.76

MEMBER END FORCES STRUCTURE TYPE = PLANE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
36	3	36	36.90	-2.22	0.00	0.00	0.00	-2.76
		37	-37.01	2.22	0.00	0.00	0.00	-0.27
37	3	37	37.02	-2.05	0.00	0.00	0.00	-0.27
		38	-37.14	2.06	0.00	0.00	0.00	-2.95
38	3	38	36.57	-6.80	0.00	0.00	0.00	2.95
		39	-36.69	6.82	0.00	0.00	0.00	-13.63
39	3	39	44.15	14.64	0.00	0.00	0.00	13.63
		40	-44.26	-14.60	0.00	0.00	0.00	9.16
40	3	40	45.78	8.75	0.00	0.00	0.00	-9.16
		41	-45.89	-8.70	0.00	0.00	0.00	22.82
41	3	41	46.63	2.61	0.00	0.00	0.00	-22.82
		42	-46.73	-2.54	0.00	0.00	0.00	26.85
42	3	42	46.76	-2.10	0.00	0.00	0.00	-26.85
		43	-46.81	2.14	0.00	0.00	0.00	25.00

***** END OF LATEST ANALYSIS RESULT *****

54. CHECK CODE ALL

STAAD-III CODE CHECKING - (AISC)

ALL UNITS ARE - KIP FEET (UNLESS OTHERWISE NOTED)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
3	ST W8X 31	PASS	AISC- H1-2	0.731	3
		46.74 C	0.00	26.87	0.87
4	ST W8X 31	PASS	AISC- H1-2	0.730	3
		46.70 C	0.00	-26.87	0.00
5	ST W8X 31	PASS	AISC- H1-2	0.646	3
		45.88 C	0.00	-22.50	0.00
6	ST W8X 31	PASS	AISC- H1-2	0.472	3
		44.23 C	0.00	-13.49	1.56
7	ST W8X 31	PASS	AISC- H1-2	0.434	3
		36.68 C	0.00	13.49	0.00
8	ST W8X 31	PASS	AISC- H1-2	0.239	3
		37.14 C	0.00	2.78	0.00
9	ST W8X 31	PASS	AISC- H1-2	0.240	3
		36.89 C	0.00	2.90	1.36
10	ST W8X 31	PASS	AISC- H1-2	0.401	3
		36.29 C	0.00	11.80	1.37
11	ST W8X 31	PASS	AISC- H1-2	0.427	3
		41.50 C	0.00	-11.80	0.00
12	ST W8X 31	PASS	AISC- H1-2	0.438	3
		42.39 C	0.00	-12.12	1.37
13	ST W8X 31	PASS	AISC- H1-2	0.487	3
		42.71 C	0.00	-14.72	1.36
14	ST W8X 31	PASS	AISC- H1-2	0.487	3
		42.65 C	0.00	14.72	0.00
15	ST W8X 31	PASS	AISC- H1-2	0.409	3
		41.92 C	0.00	10.72	0.00
16	ST W8X 31	PASS	AISC- H1-3	0.004	3
		0.63 C	0.00	0.07	1.37
17	ST W8X 31	PASS	AISC- H1-3	0.005	3
		0.56 C	0.00	0.12	1.36
18	ST W8X 31	PASS	AISC- H1-3	0.005	3
		0.56 C	0.00	-0.12	0.00
19	ST W8X 31	PASS	AISC- H1-3	0.005	3
		0.51 C	0.00	-0.13	0.00
20	ST W8X 31	PASS	AISC- H1-3	0.004	3
		0.48 C	0.00	-0.10	0.00
21	ST W8X 31	PASS	AISC- H1-3	0.005	3
		0.44 C	0.00	-0.16	1.36
22	ST W8X 31	PASS	AISC- H1-3	0.005	3
		0.47 C	0.00	0.16	0.00
23	ST W8X 31	PASS	AISC- H1-3	0.005	3
		0.47 C	0.00	-0.16	1.36
24	ST W8X 31	PASS	AISC- H1-3	0.005	3
		0.44 C	0.00	0.16	0.00
25	ST W8X 31	PASS	AISC- H1-3	0.004	3
		0.48 C	0.00	0.10	1.36
26	ST W8X 31	PASS	AISC- H1-3	0.005	3
		0.51 C	0.00	0.13	1.37

L UNITS ARE - KIP FEET (UNLESS OTHERWISE NOTED)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
27	ST W8X 31	PASS 0.51 C	AISC- H1-3 0.00	0.005 -0.13	3 0.00
28	ST W8X 31	PASS 0.56 C	AISC- H1-3 0.00	0.005 -0.12	3 0.00
29	ST W8X 31	PASS 0.63 C	AISC- H1-3 0.00	0.004 -0.07	3 0.00
30	ST W8X 31	PASS 41.95 C	AISC- H1-2 0.00	0.409 -10.68	3 1.36
31	ST W8X 31	PASS 42.67 C	AISC- H1-2 0.00	0.485 -14.63	3 1.37
32	ST W8X 31	PASS 42.74 C	AISC- H1-2 0.00	0.485 14.63	3 0.00
33	ST W8X 31	PASS 42.36 C	AISC- H1-2 0.00	0.442 12.34	3 0.00
34	ST W8X 31	PASS 41.59 C	AISC- H1-2 0.00	0.425 11.68	3 1.36
35	ST W8X 31	PASS 36.29 C	AISC- H1-2 0.00	0.398 -11.68	3 0.00
36	ST W8X 31	PASS 36.90 C	AISC- H1-2 0.00	0.238 -2.76	3 0.00
37	ST W8X 31	PASS 37.14 C	AISC- H1-2 0.00	0.242 -2.95	3 1.56
38	ST W8X 31	PASS 36.69 C	AISC- H1-2 0.00	0.436 -13.63	3 1.57
39	ST W8X 31	PASS 44.15 C	AISC- H1-2 0.00	0.474 13.63	3 0.00
40	ST W8X 31	PASS 45.89 C	AISC- H1-2 0.00	0.652 22.82	3 1.57
41	ST W8X 31	PASS 46.73 C	AISC- H1-2 0.00	0.730 26.85	3 1.57
42	ST W8X 31	PASS 46.76 C	AISC- H1-2 0.00	0.730 -26.85	3 0.00

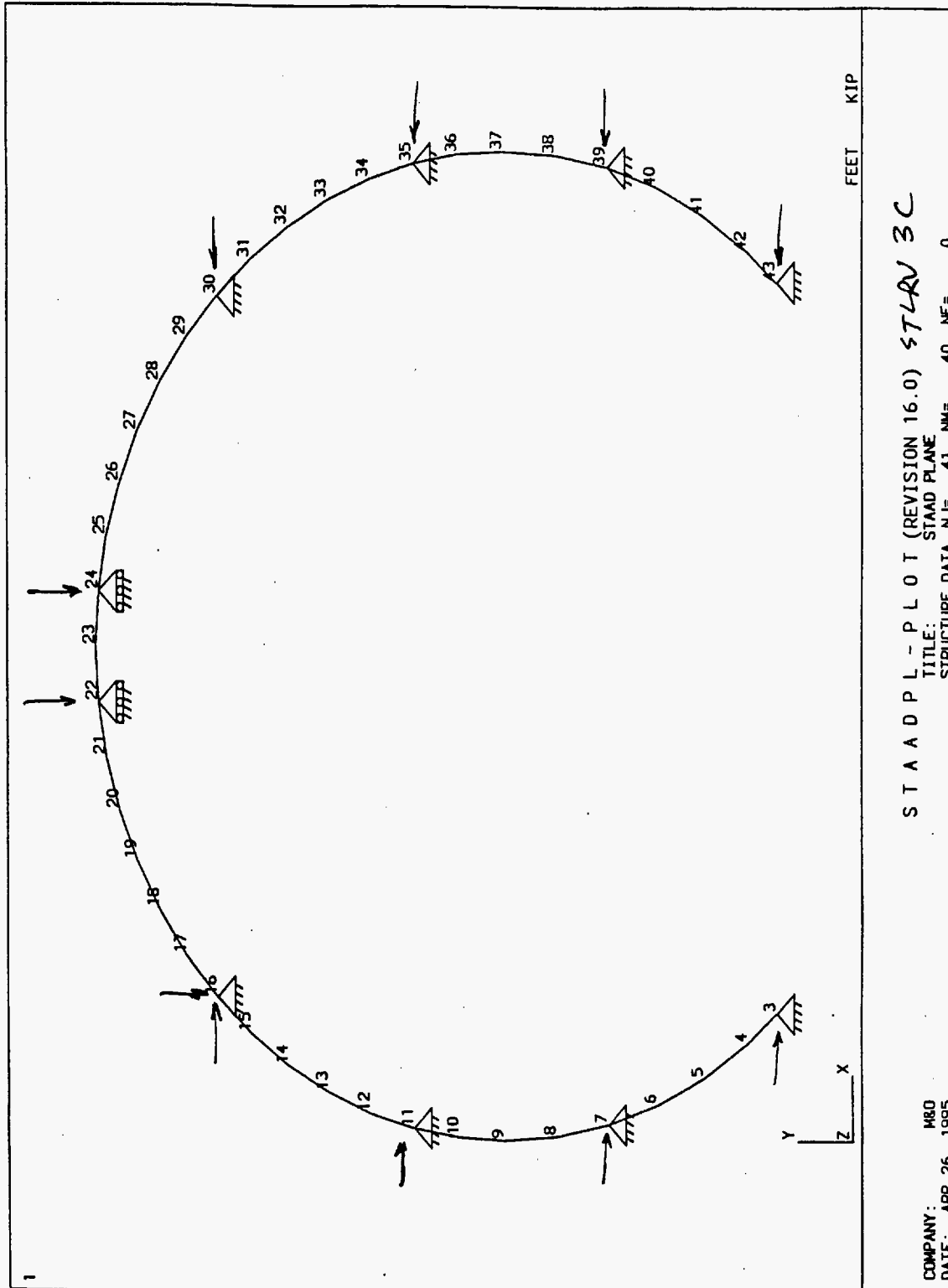
***** END OF TABULATED RESULT OF DESIGN *****

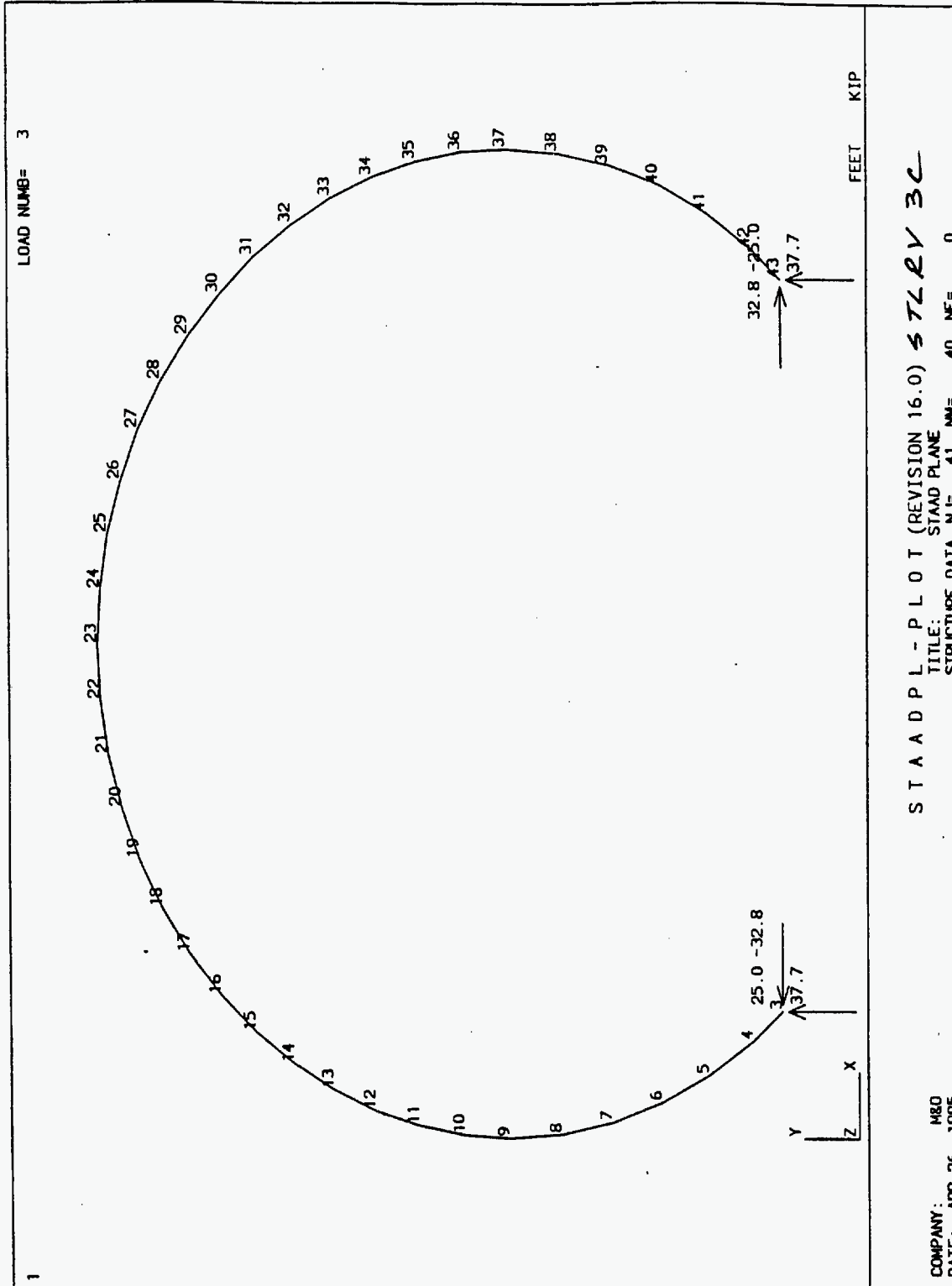
55. PLOT DISPLACEMENT FILE
56. PLOT BENDING FILE
57. FINISH

***** END OF STAAD-III *****

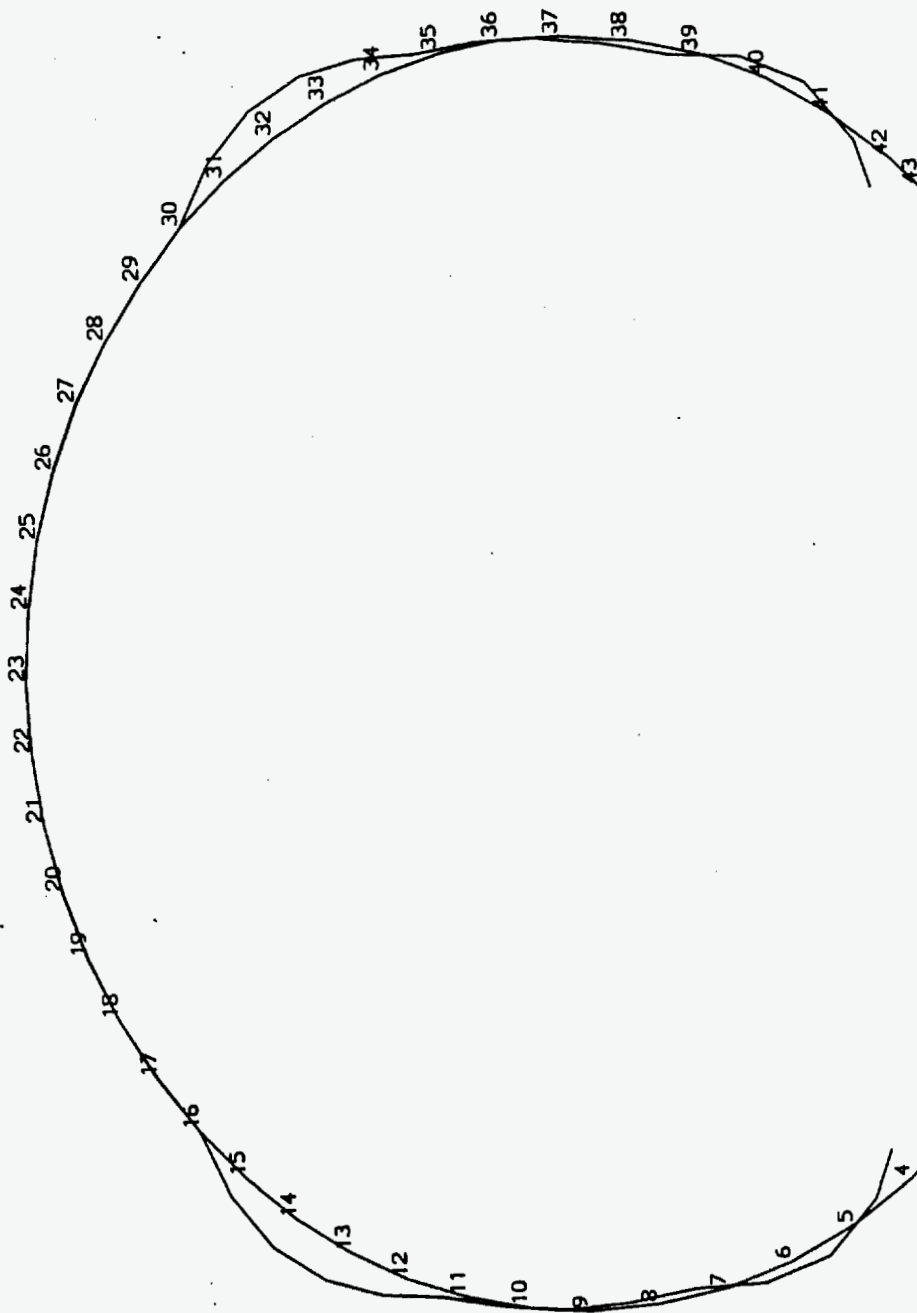
DATE= JUL 18,1995 TIME= 10:20:43 *****

* For questions on STAAD-III/ISDS, contact: *
* RESEARCH ENGINEERS, Inc at (714) 974-2500 *





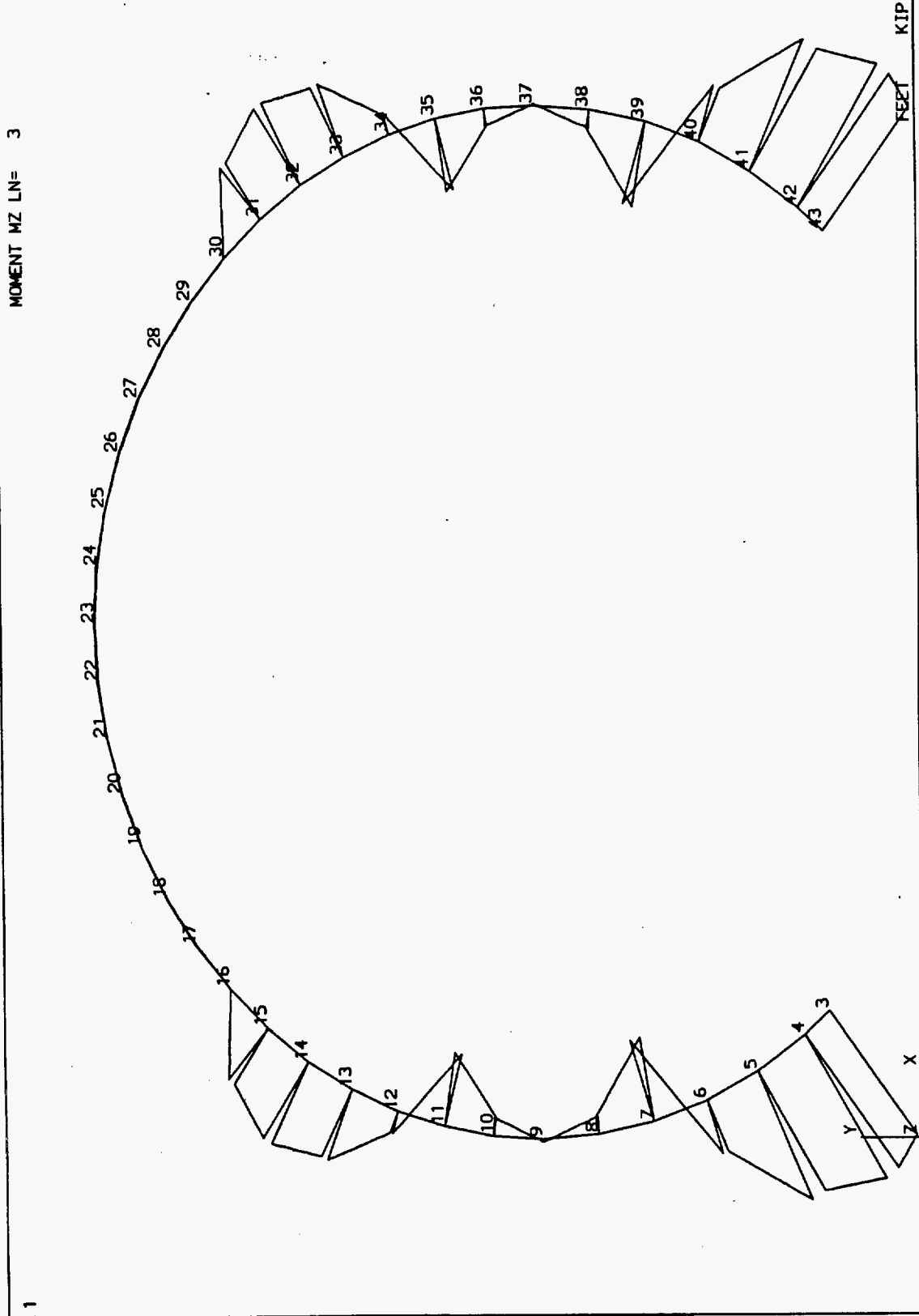
DFDR LOAD= 3



FEET KIP

STAAD PL - PLOT (REVISION 16.0) STLRV 3C
 TITLE: BABEE0000-01717-0200-00003 ATTACHMENT I
 STRUCTURE DATA NJ= 41, NM= 40, NE= 0

COMPANY: M&O
 DATE: JUL 18, 1995



STADPL - PLOT (REVISION 16.0) STLV 3C
 TITLE: BABEE0000-01717-0200-00003 ATTACHMENT I
 STRUCTURE DATA NJ= 41, NM= 40, NE= 0

COMPANY: M&O
 DATE: JUL 18, 1995

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*****
*                               *
*           S T A A D - III     *
*           Revision 16.0b      *
*           Proprietary Program of *
*           RESEARCH ENGINEERS, Inc. *
*           Date= JUL 18, 1995   *
*           Time= 10:36:37      *
*                               *
*****

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1. STAAD PLANE BABEE0000-01717-0200-00003 ATTACHMENT I
2. * ESF GROUND SUPPORT-STRUCTURAL STEEL ANALYSIS REV 00
3. * FILE STLRV3A1
4. * 25 TON JACKS APPLIED BOTH SIDES @ 47 DEGREES
5. * WITH ROCK ENGAGEMENT AT MOST JOINTS
6. UNIT FT KIP
7. JOINT COORDINATES
8. 3 3.27 2.13 ; 4 2.43 3.13
9. 5 1.58 4.44 ; 6 0.90 5.85 ; 7 0.40 7.33 ; 8 0.10 8.87
10. 9 0.0 10.43 ; 10 0.08 11.79 ; 11 0.31 13.14 ; 12 0.68 14.45
11. 13 1.21 15.71 ; 14 1.86 16.90 ; 15 2.65 18.02 ; 16 3.56 19.03
12. 17 4.58 19.94 ; 18 5.69 20.73 ; 19 6.89 21.39 ; 20 8.15 21.91
13. 21 9.46 22.29 ; 22 10.80 22.52 ; 23 12.17 22.60 ; 24 13.53 22.52
14. 25 14.87 22.29 ; 26 16.18 21.91 ; 27 17.45 21.39 ; 28 18.64 20.73
15. 29 19.75 19.94 ; 30 20.77 19.03 ; 31 21.68 18.02 ; 32 22.47 16.90
16. 33 23.13 15.71 ; 34 23.65 14.45 ; 35 24.03 13.14 ; 36 24.26 11.79
17. 37 24.33 10.43 ; 38 24.23 8.87 ; 39 23.93 7.33 ; 40 23.44 5.85
18. 41 22.76 4.44 ; 42 21.90 3.13 ; 43 21.06 2.13
19. MEMBER INCIDENCE
20. 3 3 4 42
21. UNIT KIP INCH
22. MEMBER PROPERTIES
23. 3 TO 42 TA STA W8X31
24. CONSTANTS
25. E 29000.0 ALL
26. DENSITY 0.00028 ALL
27. BETA 0 ALL
28. UNIT FT
29. SUPPORT
30. 3 5 7 9 11 35 37 39 41 43 FIXED BUT FY MZ
31. 20 21 22 23 24 25 26 FIXED BUT FX MZ
32. 14 16 18 28 30 32 PINNED
33. UNIT KIP
34. LOAD 1
35. SELF WEIGHT Y -1.0
36. LOADING 2
37. * 25 TON JACKS & SIMULTANEOUS JACKING
38. JOINT LOADING
39. 3 FX -34.1
40. 43 FX 34.1
41. 3 FY 36.57
42. 43 FY 36.57
43. 43 MZ -25.00
44. 3 MZ 25.00
45. LOADING COMBINATION 3
46. 1 2.5 2 1.0
47. PERFORM ANALYSIS

```

P R O B L E M S T A T I S T I C S

NUMBER OF JOINTS/MEMBER+ELEMENTS/SUPPORTS = 41/ 40/ 23
ORIGINAL/FINAL BAND-WIDTH = 1/ 1
TOTAL PRIMARY LOAD CASES = 2, TOTAL DEGREES OF FREEDOM = 94
SIZE OF STIFFNESS MATRIX = 564 DOUBLE PREC. WORDS
TOTAL REQUIRED DISK SPACE = 0.07 MEGA-BYTES

++ PROCESSING ELEMENT STIFFNESS MATRIX. 10:36:40
++ PROCESSING GLOBAL STIFFNESS MATRIX. 10:36:41
++ PROCESSING TRIANGULAR FACTORIZATION. 10:36:41
++ CALCULATING JOINT DISPLACEMENTS. 10:36:41
++ CALCULATING MEMBER FORCES. 10:36:42

48. LOAD LIST 3

49. PRINT ANALYSIS RESULTS

ATTACHMENT I

DI: BABEE0000-01717-0200-00003 REV 02

Title: ESF Ground Support - Structural Steel Analysis

Page: I - 98 of I-174

JOINT DISPLACEMENT (INCH RADIANS)

STRUCTURE TYPE = PLANE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
3	3	0.00000	0.03461	0.00000	0.00000	0.00000	0.00163
4	3	-0.00727	0.02439	0.00000	0.00000	0.00000	0.00040
5	3	0.00000	0.02473	0.00000	0.00000	0.00000	-0.00004
6	3	-0.00104	0.02118	0.00000	0.00000	0.00000	0.00005
7	3	0.00000	0.01864	0.00000	0.00000	0.00000	0.00006
8	3	-0.00191	0.01564	0.00000	0.00000	0.00000	0.00002
9	3	0.00000	0.01319	0.00000	0.00000	0.00000	-0.00002
10	3	-0.00079	0.01102	0.00000	0.00000	0.00000	-0.00001
11	3	0.00000	0.00863	0.00000	0.00000	0.00000	0.00005
12	3	-0.00371	0.00722	0.00000	0.00000	0.00000	0.00002
13	3	-0.00337	0.00451	0.00000	0.00000	0.00000	-0.00016
14	3	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00015
15	3	0.00053	-0.00042	0.00000	0.00000	0.00000	-0.00002
16	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001
17	3	-0.00002	0.00002	0.00000	0.00000	0.00000	0.00000
18	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
19	3	0.00002	-0.00003	0.00000	0.00000	0.00000	0.00000
20	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
21	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
22	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
23	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
24	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
25	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
26	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
27	3	-0.00002	-0.00003	0.00000	0.00000	0.00000	0.00000
28	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
29	3	0.00002	0.00003	0.00000	0.00000	0.00000	0.00000
30	3	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00001
31	3	-0.00054	-0.00043	0.00000	0.00000	0.00000	0.00002
32	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00016
33	3	0.00345	0.00460	0.00000	0.00000	0.00000	0.00016
34	3	0.00358	0.00722	0.00000	0.00000	0.00000	-0.00003
35	3	0.00000	0.00864	0.00000	0.00000	0.00000	-0.00004
36	3	0.00090	0.01105	0.00000	0.00000	0.00000	0.00001
37	3	0.00000	0.01322	0.00000	0.00000	0.00000	0.00002
38	3	0.00188	0.01567	0.00000	0.00000	0.00000	-0.00002
39	3	0.00000	0.01866	0.00000	0.00000	0.00000	-0.00005
40	3	0.00115	0.02116	0.00000	0.00000	0.00000	-0.00005
41	3	0.00000	0.02476	0.00000	0.00000	0.00000	0.00004
42	3	0.00719	0.02446	0.00000	0.00000	0.00000	-0.00040
43	3	0.00000	0.03462	0.00000	0.00000	0.00000	-0.00162

SUPPORT REACTIONS -UNIT KIP FEET STRUCTURE TYPE = PLANE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
3	3	-5.08	0.00	0.00	0.00	0.00	0.00
5	3	25.28	0.00	0.00	0.00	0.00	0.00
7	3	9.28	0.00	0.00	0.00	0.00	0.00
9	3	8.23	0.00	0.00	0.00	0.00	0.00
11	3	10.91	0.00	0.00	0.00	0.00	0.00
35	3	-11.09	0.00	0.00	0.00	0.00	0.00
37	3	-8.12	0.00	0.00	0.00	0.00	0.00
39	3	-9.17	0.00	0.00	0.00	0.00	0.00
41	3	-25.55	0.00	0.00	0.00	0.00	0.00
43	3	5.24	0.00	0.00	0.00	0.00	0.00
20	3	0.00	0.17	0.00	0.00	0.00	0.00
21	3	0.00	0.09	0.00	0.00	0.00	0.00
22	3	0.00	0.10	0.00	0.00	0.00	0.00
23	3	0.00	0.10	0.00	0.00	0.00	0.00
24	3	0.00	0.10	0.00	0.00	0.00	0.00
25	3	0.00	0.09	0.00	0.00	0.00	0.00
26	3	0.00	0.17	0.00	0.00	0.00	0.00
14	3	-13.16	-35.48	0.00	0.00	0.00	0.00
16	3	-1.44	0.51	0.00	0.00	0.00	0.00
18	3	0.10	0.15	0.00	0.00	0.00	0.00
28	3	-0.10	0.15	0.00	0.00	0.00	0.00
30	3	1.46	0.52	0.00	0.00	0.00	0.00
32	3	13.22	-35.49	0.00	0.00	0.00	0.00

MEMBER END FORCES STRUCTURE TYPE = PLANE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
3	3	3	53.20	-6.48	0.00	0.00	0.00	-25.00
		4	-53.13	6.55	0.00	0.00	0.00	16.49
4	3	4	51.92	-13.02	0.00	0.00	0.00	-16.49
		5	-51.82	13.08	0.00	0.00	0.00	-3.89
5	3	5	38.78	3.26	0.00	0.00	0.00	3.89
		6	-38.67	-3.21	0.00	0.00	0.00	1.18
6	3	6	38.78	-1.58	0.00	0.00	0.00	-1.18
		7	-38.66	1.62	0.00	0.00	0.00	-1.31
7	3	7	36.33	2.37	0.00	0.00	0.00	1.31
		8	-36.21	-2.34	0.00	0.00	0.00	2.38
8	3	8	36.21	-2.31	0.00	0.00	0.00	-2.38
		9	-36.09	2.32	0.00	0.00	0.00	-1.24
9	3	9	36.02	-1.49	0.00	0.00	0.00	-1.24
		10	-35.92	1.50	0.00	0.00	0.00	-0.79
10	3	10	35.86	2.45	0.00	0.00	0.00	0.79
		11	-35.76	-2.44	0.00	0.00	0.00	2.56
11	3	11	38.26	-4.27	0.00	0.00	0.00	-2.56
		12	-38.16	4.30	0.00	0.00	0.00	-3.28
12	3	12	38.40	0.41	0.00	0.00	0.00	3.28
		13	-38.30	-0.37	0.00	0.00	0.00	-2.75
13	3	13	38.07	4.26	0.00	0.00	0.00	2.75
		14	-37.98	-4.21	0.00	0.00	0.00	2.99
14	3	14	0.66	-1.18	0.00	0.00	0.00	-2.99
		15	-0.58	1.24	0.00	0.00	0.00	1.33
15	3	15	0.72	-1.16	0.00	0.00	0.00	-1.33
		16	-0.64	1.23	0.00	0.00	0.00	-0.29
16	3	16	0.04	0.18	0.00	0.00	0.00	0.29
		17	0.03	-0.10	0.00	0.00	0.00	-0.10
17	3	17	-0.04	0.10	0.00	0.00	0.00	0.10
		18	0.10	-0.02	0.00	0.00	0.00	-0.02
18	3	18	0.06	0.09	0.00	0.00	0.00	0.02
		19	-0.01	0.00	0.00	0.00	0.00	0.04

MEMBER END FORCES STRUCTURE TYPE = PLANE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
19	3	19	0.01	0.00	0.00	0.00	0.00	-0.04
		20	0.03	0.10	0.00	0.00	0.00	-0.03
20	3	20	0.03	0.06	0.00	0.00	0.00	0.03
		21	0.00	0.04	0.00	0.00	0.00	-0.01
21	3	21	0.02	0.05	0.00	0.00	0.00	0.01
		22	0.00	0.05	0.00	0.00	0.00	-0.01
22	3	22	0.02	0.05	0.00	0.00	0.00	0.01
		23	-0.01	0.05	0.00	0.00	0.00	-0.01
23	3	23	0.01	0.05	0.00	0.00	0.00	0.01
		24	-0.02	0.05	0.00	0.00	0.00	-0.01
24	3	24	0.00	0.05	0.00	0.00	0.00	0.01
		25	-0.02	0.05	0.00	0.00	0.00	-0.01
25	3	25	0.00	0.04	0.00	0.00	0.00	0.01
		26	-0.03	0.06	0.00	0.00	0.00	-0.03
26	3	26	-0.03	0.10	0.00	0.00	0.00	0.03
		27	-0.01	0.00	0.00	0.00	0.00	0.04
27	3	27	0.01	0.00	0.00	0.00	0.00	-0.04
		28	-0.06	0.09	0.00	0.00	0.00	-0.02
28	3	28	-0.10	-0.02	0.00	0.00	0.00	0.02
		29	0.04	0.10	0.00	0.00	0.00	-0.10
29	3	29	-0.03	-0.11	0.00	0.00	0.00	0.10
		30	-0.04	0.18	0.00	0.00	0.00	-0.30
30	3	30	0.66	1.25	0.00	0.00	0.00	0.30
		31	-0.73	-1.18	0.00	0.00	0.00	1.35
31	3	31	0.59	1.26	0.00	0.00	0.00	-1.35
		32	-0.67	-1.20	0.00	0.00	0.00	3.04
32	3	32	37.99	-4.39	0.00	0.00	0.00	-3.04
		33	-38.08	4.44	0.00	0.00	0.00	-2.96
33	3	33	38.34	-0.04	0.00	0.00	0.00	2.96
		34	-38.43	0.08	0.00	0.00	0.00	-3.04
34	3	34	38.21	4.11	0.00	0.00	0.00	3.04
		35	-38.31	-4.08	0.00	0.00	0.00	2.54
35	3	35	35.74	-2.54	0.00	0.00	0.00	-2.54
		36	-35.84	2.56	0.00	0.00	0.00	-0.95

MEMBER END FORCES STRUCTURE TYPE = PLANE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
36	3	36	35.90	1.65	0.00	0.00	0.00	0.95
		37	-36.00	-1.65	0.00	0.00	0.00	1.29
37	3	37	36.09	2.32	0.00	0.00	0.00	1.29
		38	-36.21	-2.31	0.00	0.00	0.00	2.33
38	3	38	36.21	-2.34	0.00	0.00	0.00	-2.33
		39	-36.33	2.37	0.00	0.00	0.00	-1.37
39	3	39	38.62	1.75	0.00	0.00	0.00	1.37
		40	-38.73	-1.71	0.00	0.00	0.00	1.33
40	3	40	38.63	-3.31	0.00	0.00	0.00	-1.33
		41	-38.73	3.36	0.00	0.00	0.00	-3.90
41	3	41	51.98	12.94	0.00	0.00	0.00	3.90
		42	-52.08	-12.88	0.00	0.00	0.00	16.33
42	3	42	53.23	6.67	0.00	0.00	0.00	-16.33
		43	-53.31	-6.60	0.00	0.00	0.00	25.00

***** END OF LATEST ANALYSIS RESULT *****

50. CHECK CODE ALL

STAAD-III CODE CHECKING - (AISC)

ALL UNITS ARE - KIP FEET (UNLESS OTHERWISE NOTED)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
=====					
3	ST W8X 31	PASS	AISC- H1-2	0.729	3
		53.20 C	0.00	-25.00	0.00
4	ST W8X 31	PASS	AISC- H1-2	0.566	3
		51.92 C	0.00	-16.49	0.00
5	ST W8X 31	PASS	AISC- H1-2	0.268	3
		38.78 C	0.00	3.89	0.00
6	ST W8X 31	PASS	AISC- H1-1	0.220	3
		38.66 C	0.00	-1.31	1.56
7	ST W8X 31	PASS	AISC- H1-2	0.227	3
		36.21 C	0.00	2.38	1.57
8	ST W8X 31	PASS	AISC- H1-2	0.227	3
		36.21 C	0.00	-2.38	0.00
9	ST W8X 31	PASS	AISC- H1-2	0.205	3
		36.02 C	0.00	-1.24	0.00
10	ST W8X 31	PASS	AISC- H1-2	0.228	3
		35.76 C	0.00	2.56	1.37
11	ST W8X 31	PASS	AISC- H1-2	0.254	3
		38.16 C	0.00	-3.28	1.36
12	ST W8X 31	PASS	AISC- H1-2	0.255	3
		38.40 C	0.00	3.28	0.00
13	ST W8X 31	PASS	AISC- H1-2	0.248	3
		37.98 C	0.00	2.99	1.36
14	ST W8X 31	PASS	AISC- H1-3	0.058	3
		0.66 C	0.00	-2.99	0.00
15	ST W8X 31	PASS	SHEAR -Y	0.038	3
		0.64 C	0.00	-0.29	1.36
16	ST W8X 31	PASS	AISC- H1-3	0.006	3
		0.04 C	0.00	0.29	0.00
17	ST W8X 31	PASS	SHEAR -Y	0.003	3
		0.04 T	0.00	0.10	0.00
18	ST W8X 31	PASS	SHEAR -Y	0.003	3
		0.06 C	0.00	0.02	0.00
19	ST W8X 31	PASS	SHEAR -Y	0.003	3
		0.03 T	0.00	-0.03	1.36
20	ST W8X 31	PASS	SHEAR -Y	0.002	3
		0.03 C	0.00	0.03	0.00
21	ST W8X 31	PASS	SHEAR -Y	0.002	3
		0.02 C	0.00	0.01	0.00
22	ST W8X 31	PASS	SHEAR -Y	0.002	3
		0.02 C	0.00	0.01	0.00
23	ST W8X 31	PASS	SHEAR -Y	0.002	3
		0.01 C	0.00	0.01	0.00
24	ST W8X 31	PASS	SHEAR -Y	0.002	3
		0.00 C	0.00	0.01	0.00
25	ST W8X 31	PASS	SHEAR -Y	0.002	3
		0.03 C	0.00	-0.03	1.36
26	ST W8X 31	PASS	SHEAR -Y	0.003	3
		0.03 T	0.00	0.03	0.00

ALL UNITS ARE - KIP FEET (UNLESS OTHERWISE NOTED)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
27	ST W8X 31	PASS	SHEAR -Y	0.003	3
		0.06 C	0.00	-0.02	1.36
28	ST W8X 31	PASS	SHEAR -Y	0.003	3
		0.04 T	0.00	-0.10	1.36
29	ST W8X 31	PASS	AISC- H1-3	0.006	3
		0.04 C	0.00	-0.30	1.37
30	ST W8X 31	PASS	SHEAR -Y	0.038	3
		0.66 C	0.00	0.30	0.00
31	ST W8X 31	PASS	AISC- H1-3	0.059	3
		0.67 C	0.00	3.04	1.37
32	ST W8X 31	PASS	AISC- H1-2	0.248	3
		37.99 C	0.00	-3.04	0.00
33	ST W8X 31	PASS	AISC- H1-2	0.251	3
		38.43 C	0.00	-3.04	1.36
34	ST W8X 31	PASS	AISC- H1-2	0.250	3
		38.21 C	0.00	3.04	0.00
35	ST W8X 31	PASS	AISC- H1-2	0.228	3
		35.74 C	0.00	-2.54	0.00
36	ST W8X 31	PASS	AISC- H1-2	0.206	3
		36.00 C	0.00	1.29	1.36
37	ST W8X 31	PASS	AISC- H1-2	0.226	3
		36.21 C	0.00	2.33	1.56
38	ST W8X 31	PASS	AISC- H1-2	0.226	3
		36.21 C	0.00	-2.33	0.00
39	ST W8X 31	PASS	AISC- H1-1	0.221	3
		38.62 C	0.00	1.37	0.00
40	ST W8X 31	PASS	AISC- H1-2	0.268	3
		38.73 C	0.00	-3.90	1.57
41	ST W8X 31	PASS	AISC- H1-2	0.564	3
		52.08 C	0.00	16.33	1.57
42	ST W8X 31	PASS	AISC- H1-2	0.729	3
		53.31 C	0.00	25.00	1.31

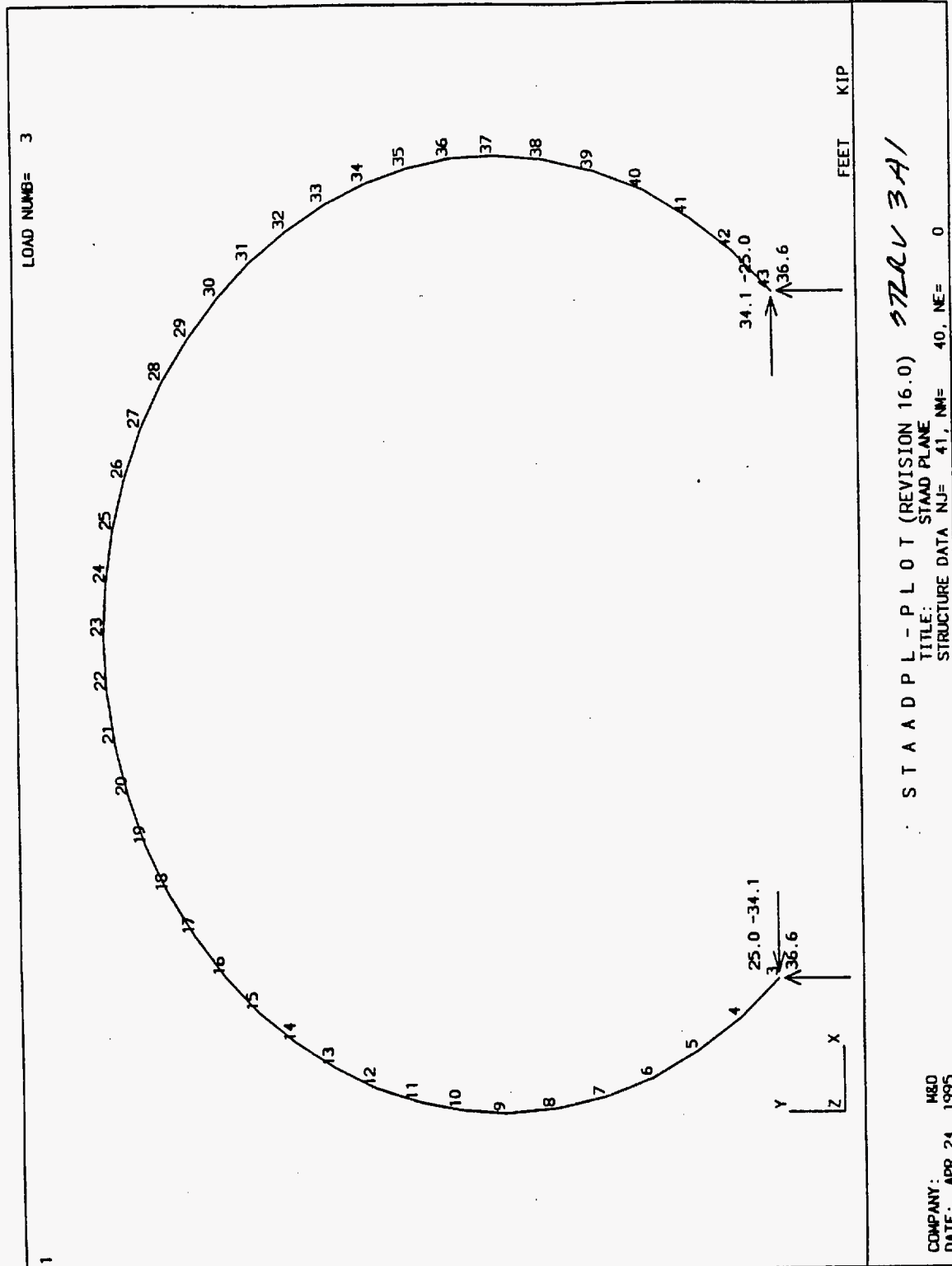
***** END OF TABULATED RESULT OF DESIGN *****

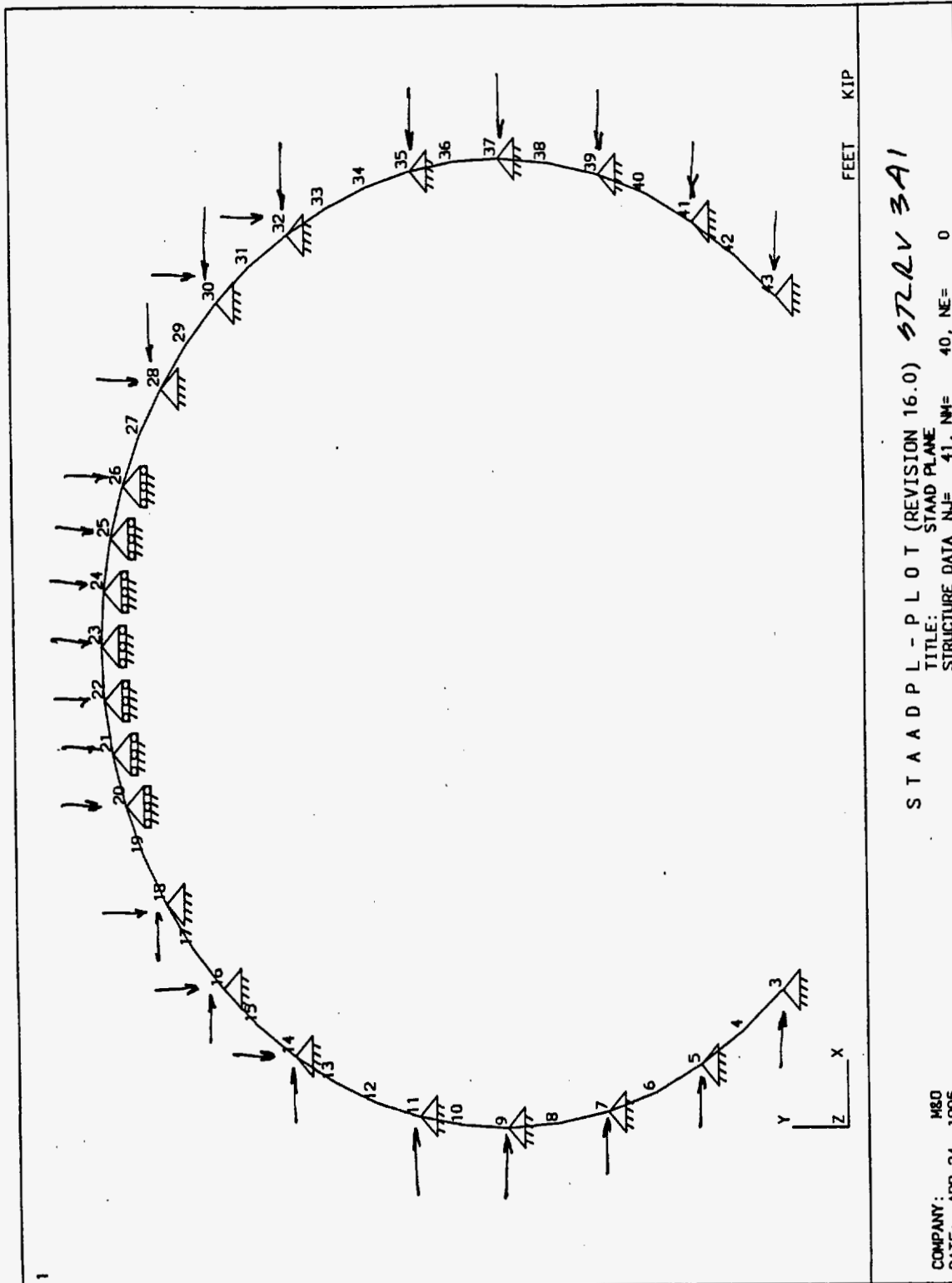
51. PLOT DISPLACEMENT FILE
52. PLOT BENDING FILE
53. FINISH

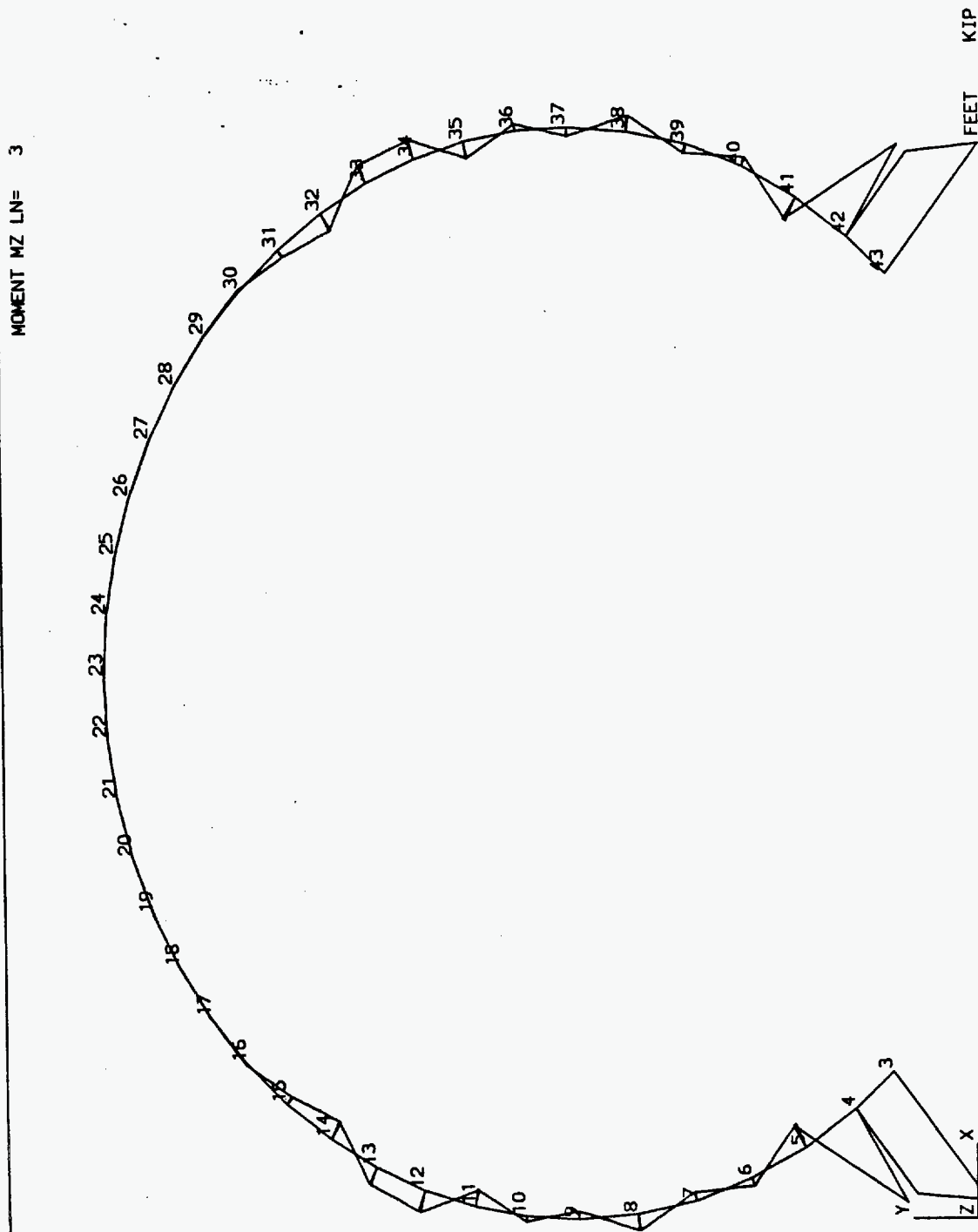
***** END OF STAAD-III *****

DATE= JUL 18,1995 TIME= 10:36:45 *****

* For questions on STAAD-III/ISDS, contact: *
* RESEARCH ENGINEERS, Inc at (714) 974-2500 *



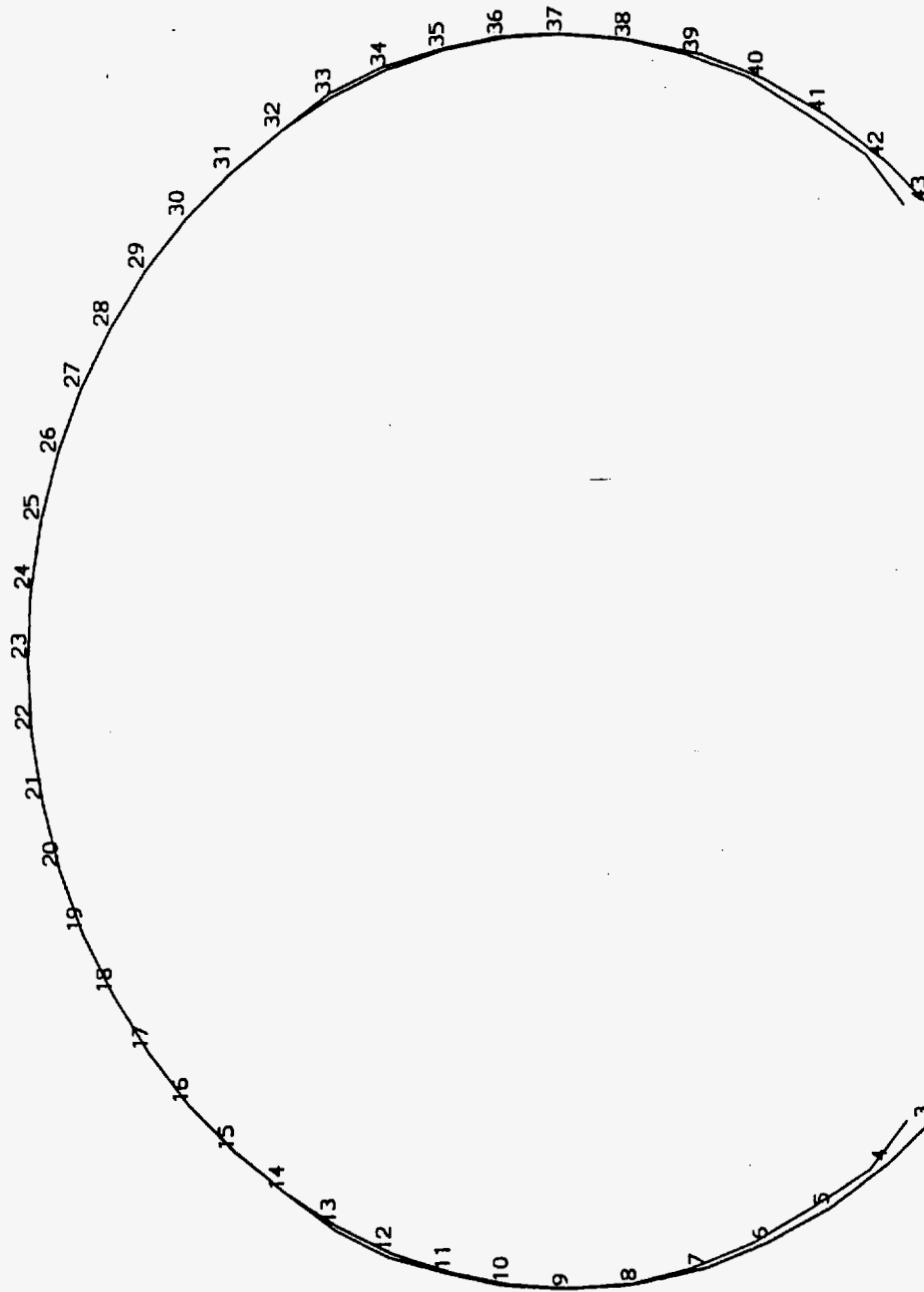




STADPL - PLOT (REVISION 16.0) ST2V 3A1
 TITLE: BABEE0000-01717-0200-00003 ATTACHMENT I
 STRUCTURE DATA NJ= 41, NM= 40, NE= 0

COMPANY: M&O
 DATE: JUL 18, 1995

DFDR LOAD= 3



FEET KIP

STADPL - PLOT (REVISION 16.0) *STC2V3A1*
 TITLE: BABEE0000-01717-0200-00003 ATTACHMENT I
 STRUCTURE DATA NJ= 41, NM= 40, NE= 0

COMPANY: M&O
 DATE: JUL 18, 1995

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*****
*
*           S T A A D - III
*           Revision 16.0b
*           Proprietary Program of
*           RESEARCH ENGINEERS, Inc.
*           Date=      JUL 18, 1995
*           Time=      11: 2:59
*
*****

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1. STAAD PLANE BABEE0000-01717-0200-00003 ATTACHMENT I
2. * ESF GROUND SUPPORT-STRUCTURAL STEEL ANALYSIS REV 00
3. * FILE STLRV3A2
4. * 25 TON JACKS APPLIED BOTH SIDES @ 47 DEGREES
5. * WITH ROCK ENGAGEMENT AT ALL JOINTS
6. UNIT FT KIP
7. JOINT COORDINATES
8. 3 3.27 2.13 ; 4 2.43 3.13
9. 5 1.58 4.44 ; 6 0.90 5.85 ; 7 0.40 7.33 ; 8 0.10 8.87
10. 9 0.0 10.43 ; 10 0.08 11.79 ; 11 0.31 13.14 ; 12 0.68 14.45
11. 13 1.21 15.71 ; 14 1.86 16.90 ; 15 2.65 18.02 ; 16 3.56 19.03
12. 17 4.58 19.94 ; 18 5.69 20.73 ; 19 6.89 21.39 ; 20 8.15 21.91
13. 21 9.46 22.29 ; 22 10.80 22.52 ; 23 12.17 22.60 ; 24 13.53 22.52
14. 25 14.87 22.29 ; 26 16.18 21.91 ; 27 17.45 21.39 ; 28 18.64 20.73
15. 29 19.75 19.94 ; 30 20.77 19.03 ; 31 21.68 18.02 ; 32 22.47 16.90
16. 33 23.13 15.71 ; 34 23.65 14.45 ; 35 24.03 13.14 ; 36 24.26 11.79
17. 37 24.33 10.43 ; 38 24.23 8.87 ; 39 23.93 7.33 ; 40 23.44 5.85
18. 41 22.76 4.44 ; 42 21.90 3.13 ; 43 21.06 2.13
19. MEMBER INCIDENCE
20. 3 3 4 42
21. UNIT KIP INCH
22. MEMBER PROPERTIES
23. 3 TO 42 TA STA W8X31
24. CONSTANTS
25. E 29000.0 ALL
26. DENSITY 0.00028 ALL
27. BETA 0 ALL
28. UNIT FT
29. SUPPORT
30. 3 4 5 6 7 8 9 10 11 12 13 FIXED BUT FY MZ
31. 33 34 35 36 37 38 39 40 41 42 43 FIXED BUT FY MZ
32. 19 20 21 22 23 24 25 26 27 FIXED BUT FX MZ
33. 14 15 16 17 18 28 29 30 31 32 PINNED
34. UNIT KIP
35. LOAD 1
36. SELF WEIGHT Y -1.0
37. LOADING 2
38. * 25 TON JACKS & SIMULTANEOUS JACKING
39. JOINT LOADING
40. 3 FX -34.1
41. 43 FX 34.1
42. 3 FY 36.57
43. 43 FY 36.57
44. 43 MZ -25.00
45. 3 MZ 25.00
46. LOADING COMBINATION 3
47. 1 2.5 2 1.0

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48. PERFORM ANALYSIS

P R O B L E M S T A T I S T I C S

NUMBER OF JOINTS/MEMBER+ELEMENTS/SUPPORTS = 41/ 40/ 41
ORIGINAL/FINAL BAND-WIDTH = 1/ 1
TOTAL PRIMARY LOAD CASES = 2, TOTAL DEGREES OF FREEDOM = 72
SIZE OF STIFFNESS MATRIX = 288 DOUBLE PREC. WORDS
TOTAL REQUIRED DISK SPACE = 0.07 MEGA-BYTES

++ PROCESSING ELEMENT STIFFNESS MATRIX.	11: 3: 1
++ PROCESSING GLOBAL STIFFNESS MATRIX.	11: 3: 2
++ PROCESSING TRIANGULAR FACTORIZATION.	11: 3: 2
++ CALCULATING JOINT DISPLACEMENTS.	11: 3: 3
++ CALCULATING MEMBER FORCES.	11: 3: 3

49. LOAD LIST 3

50. PRINT ANALYSIS RESULTS

JOINT DISPLACEMENT (INCH RADIANS)

STRUCTURE TYPE = PLANE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
3	3	0.00000	0.03200	0.00000	0.00000	0.00000	0.00120
4	3	0.00000	0.02731	0.00000	0.00000	0.00000	0.00031
5	3	0.00000	0.02351	0.00000	0.00000	0.00000	0.00011
6	3	0.00000	0.02032	0.00000	0.00000	0.00000	0.00006
7	3	0.00000	0.01747	0.00000	0.00000	0.00000	0.00004
8	3	0.00000	0.01481	0.00000	0.00000	0.00000	0.00002
9	3	0.00000	0.01225	0.00000	0.00000	0.00000	0.00000
10	3	0.00000	0.01003	0.00000	0.00000	0.00000	-0.00002
11	3	0.00000	0.00775	0.00000	0.00000	0.00000	-0.00003
12	3	0.00000	0.00538	0.00000	0.00000	0.00000	-0.00005
13	3	0.00000	0.00279	0.00000	0.00000	0.00000	-0.00006
14	3	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00004
15	3	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00001
16	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
17	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
18	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
19	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
20	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
21	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
22	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
23	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
24	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
25	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
26	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
27	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
28	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
29	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
30	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
31	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00001
32	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00004
33	3	0.00000	0.00282	0.00000	0.00000	0.00000	0.00006
34	3	0.00000	0.00539	0.00000	0.00000	0.00000	0.00005
35	3	0.00000	0.00777	0.00000	0.00000	0.00000	0.00003
36	3	0.00000	0.01005	0.00000	0.00000	0.00000	0.00002
37	3	0.00000	0.01227	0.00000	0.00000	0.00000	0.00000
38	3	0.00000	0.01483	0.00000	0.00000	0.00000	-0.00002
39	3	0.00000	0.01749	0.00000	0.00000	0.00000	-0.00004
40	3	0.00000	0.02033	0.00000	0.00000	0.00000	-0.00006
41	3	0.00000	0.02351	0.00000	0.00000	0.00000	-0.00011
42	3	0.00000	0.02735	0.00000	0.00000	0.00000	-0.00032
43	3	0.00000	0.03204	0.00000	0.00000	0.00000	-0.00120

SUPPORT REACTIONS -UNIT KIP FEET STRUCTURE TYPE = PLANE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
3	3	-16.66	0.00	0.00	0.00	0.00	0.00
4	3	24.06	0.00	0.00	0.00	0.00	0.00
5	3	8.84	0.00	0.00	0.00	0.00	0.00
6	3	5.58	0.00	0.00	0.00	0.00	0.00
7	3	5.22	0.00	0.00	0.00	0.00	0.00
8	3	4.74	0.00	0.00	0.00	0.00	0.00
9	3	4.42	0.00	0.00	0.00	0.00	0.00
10	3	3.99	0.00	0.00	0.00	0.00	0.00
11	3	4.00	0.00	0.00	0.00	0.00	0.00
12	3	4.72	0.00	0.00	0.00	0.00	0.00
13	3	3.59	0.00	0.00	0.00	0.00	0.00
33	3	-4.09	0.00	0.00	0.00	0.00	0.00
34	3	-4.23	0.00	0.00	0.00	0.00	0.00
35	3	-4.24	0.00	0.00	0.00	0.00	0.00
36	3	-4.24	0.00	0.00	0.00	0.00	0.00
37	3	-4.17	0.00	0.00	0.00	0.00	0.00
38	3	-4.73	0.00	0.00	0.00	0.00	0.00
39	3	-5.00	0.00	0.00	0.00	0.00	0.00
40	3	-5.81	0.00	0.00	0.00	0.00	0.00
41	3	-9.09	0.00	0.00	0.00	0.00	0.00
42	3	-23.83	0.00	0.00	0.00	0.00	0.00
43	3	16.68	0.00	0.00	0.00	0.00	0.00
19	3	0.00	0.11	0.00	0.00	0.00	0.00
20	3	0.00	0.10	0.00	0.00	0.00	0.00
21	3	0.00	0.10	0.00	0.00	0.00	0.00
22	3	0.00	0.10	0.00	0.00	0.00	0.00
23	3	0.00	0.11	0.00	0.00	0.00	0.00
24	3	0.00	0.10	0.00	0.00	0.00	0.00
25	3	0.00	0.10	0.00	0.00	0.00	0.00
26	3	0.00	0.11	0.00	0.00	0.00	0.00
27	3	0.00	0.11	0.00	0.00	0.00	0.00
14	3	-17.91	-35.64	0.00	0.00	0.00	0.00
15	3	-0.43	0.39	0.00	0.00	0.00	0.00
16	3	-0.06	0.15	0.00	0.00	0.00	0.00
17	3	-0.01	0.11	0.00	0.00	0.00	0.00
18	3	0.00	0.11	0.00	0.00	0.00	0.00
28	3	0.00	0.11	0.00	0.00	0.00	0.00
29	3	0.01	0.11	0.00	0.00	0.00	0.00
30	3	0.06	0.15	0.00	0.00	0.00	0.00
31	3	0.44	0.40	0.00	0.00	0.00	0.00
32	3	18.16	-35.65	0.00	0.00	0.00	0.00

MEMBER END FORCES STRUCTURE TYPE = PLANE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
3	3	3	60.65	-15.34	0.00	0.00	0.00	-25.00
		4	-60.57	15.41	0.00	0.00	0.00	4.92
4	3	4	45.13	-2.55	0.00	0.00	0.00	-4.92
		5	-45.03	2.61	0.00	0.00	0.00	0.89
5	3	5	40.50	-0.30	0.00	0.00	0.00	-0.89
		6	-40.39	0.35	0.00	0.00	0.00	0.39
6	3	6	38.25	-0.03	0.00	0.00	0.00	-0.39
		7	-38.14	0.07	0.00	0.00	0.00	0.31
7	3	7	36.79	-0.02	0.00	0.00	0.00	-0.31
		8	-36.67	0.04	0.00	0.00	0.00	0.26
8	3	8	36.06	0.00	0.00	0.00	0.00	-0.26
		9	-35.94	0.01	0.00	0.00	0.00	0.25
9	3	9	35.93	0.00	0.00	0.00	0.00	0.25
		10	-35.83	0.00	0.00	0.00	0.00	-0.25
10	3	10	36.28	0.00	0.00	0.00	0.00	0.25
		11	-36.18	0.02	0.00	0.00	0.00	-0.27
11	3	11	37.06	-0.02	0.00	0.00	0.00	0.27
		12	-36.96	0.05	0.00	0.00	0.00	-0.32
12	3	12	38.52	0.13	0.00	0.00	0.00	0.32
		13	-38.42	-0.09	0.00	0.00	0.00	-0.16
13	3	13	39.93	0.85	0.00	0.00	0.00	0.16
		14	-39.84	-0.80	0.00	0.00	0.00	0.95
14	3	14	0.04	-0.57	0.00	0.00	0.00	-0.95
		15	0.04	0.63	0.00	0.00	0.00	0.13
15	3	15	0.04	-0.05	0.00	0.00	0.00	-0.13
		16	0.04	0.12	0.00	0.00	0.00	0.01
16	3	16	0.03	0.03	0.00	0.00	0.00	-0.01
		17	0.03	0.05	0.00	0.00	0.00	-0.01
17	3	17	0.03	0.04	0.00	0.00	0.00	0.01
		18	0.03	0.04	0.00	0.00	0.00	-0.01
18	3	18	0.03	0.05	0.00	0.00	0.00	0.01
		19	0.03	0.05	0.00	0.00	0.00	-0.01

MEMBER END FORCES STRUCTURE TYPE = PLANE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
19	3	19	0.02	0.05	0.00	0.00	0.00	0.01
		20	0.02	0.05	0.00	0.00	0.00	-0.01
20	3	20	0.01	0.05	0.00	0.00	0.00	0.01
		21	0.01	0.05	0.00	0.00	0.00	-0.01
21	3	21	0.01	0.05	0.00	0.00	0.00	0.01
		22	0.01	0.05	0.00	0.00	0.00	-0.01
22	3	22	0.00	0.05	0.00	0.00	0.00	0.01
		23	0.00	0.05	0.00	0.00	0.00	-0.01
23	3	23	0.00	0.05	0.00	0.00	0.00	0.01
		24	0.00	0.05	0.00	0.00	0.00	-0.01
24	3	24	-0.01	0.05	0.00	0.00	0.00	0.01
		25	-0.01	0.05	0.00	0.00	0.00	-0.01
25	3	25	-0.01	0.05	0.00	0.00	0.00	0.01
		26	-0.01	0.05	0.00	0.00	0.00	-0.01
26	3	26	-0.02	0.05	0.00	0.00	0.00	0.01
		27	-0.02	0.05	0.00	0.00	0.00	-0.01
27	3	27	-0.03	0.05	0.00	0.00	0.00	0.01
		28	-0.03	0.04	0.00	0.00	0.00	-0.01
28	3	28	-0.03	0.04	0.00	0.00	0.00	0.01
		29	-0.03	0.04	0.00	0.00	0.00	-0.01
29	3	29	-0.03	0.05	0.00	0.00	0.00	0.01
		30	-0.03	0.03	0.00	0.00	0.00	0.01
30	3	30	-0.04	0.12	0.00	0.00	0.00	-0.01
		31	-0.04	-0.05	0.00	0.00	0.00	0.13
31	3	31	-0.04	0.64	0.00	0.00	0.00	-0.13
		32	-0.04	-0.58	0.00	0.00	0.00	0.97
32	3	32	39.96	-0.83	0.00	0.00	0.00	-0.97
		33	-40.05	0.88	0.00	0.00	0.00	-0.19
33	3	33	38.33	-0.06	0.00	0.00	0.00	0.19
		34	-38.43	0.10	0.00	0.00	0.00	-0.29
34	3	34	37.03	0.02	0.00	0.00	0.00	0.29
		35	-37.13	0.01	0.00	0.00	0.00	-0.28
35	3	35	36.18	0.02	0.00	0.00	0.00	0.28
		36	-36.28	0.00	0.00	0.00	0.00	-0.27

MEMBER END FORCES STRUCTURE TYPE = PLANE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
36	3	36	35.81	0.02	0.00	0.00	0.00	0.27
		37	-35.92	-0.01	0.00	0.00	0.00	-0.24
37	3	37	35.94	0.01	0.00	0.00	0.00	-0.24
		38	-36.06	-0.01	0.00	0.00	0.00	0.26
38	3	38	36.67	0.04	0.00	0.00	0.00	-0.26
		39	-36.79	-0.01	0.00	0.00	0.00	0.30
39	3	39	38.07	0.09	0.00	0.00	0.00	-0.30
		40	-38.18	-0.05	0.00	0.00	0.00	0.40
40	3	40	40.39	0.35	0.00	0.00	0.00	-0.40
		41	-40.50	-0.29	0.00	0.00	0.00	0.91
41	3	41	45.18	2.58	0.00	0.00	0.00	-0.91
		42	-45.28	-2.51	0.00	0.00	0.00	4.90
42	3	42	60.58	15.42	0.00	0.00	0.00	-4.90
		43	-60.66	-15.36	0.00	0.00	0.00	25.00

***** END OF LATEST ANALYSIS RESULT *****

51. CHECK CODE ALL

STAAD-III CODE CHECKING - (AISC)

ALL UNITS ARE - KIP FEET (UNLESS OTHERWISE NOTED)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
=====					
3	ST W8X 31	PASS	AISC- H1-2	0.767	3
		60.65 C	0.00	-25.00	0.00
4	ST W8X 31	PASS	AISC- H1-2	0.319	3
		45.13 C	0.00	-4.92	0.00
5	ST W8X 31	PASS	AISC- H1-1	0.223	3
		40.50 C	0.00	-0.89	0.00
6	ST W8X 31	PASS	AISC- H1-1	0.204	3
		38.25 C	0.00	-0.39	0.00
7	ST W8X 31	PASS	AISC- H1-1	0.195	3
		36.79 C	0.00	-0.31	0.00
8	ST W8X 31	PASS	AISC- H1-1	0.191	3
		36.06 C	0.00	-0.26	0.00
9	ST W8X 31	PASS	AISC- H1-1	0.189	3
		35.93 C	0.00	0.25	0.00
10	ST W8X 31	PASS	AISC- H1-1	0.191	3
		36.28 C	0.00	0.25	0.00
11	ST W8X 31	PASS	AISC- H1-1	0.195	3
		36.96 C	0.00	-0.32	1.36
12	ST W8X 31	PASS	AISC- H1-1	0.204	3
		38.52 C	0.00	0.32	0.00
13	ST W8X 31	PASS	AISC- H1-1	0.220	3
		39.84 C	0.00	0.95	1.36
14	ST W8X 31	PASS	SHEAR -Y	0.019	3
		0.04 T	0.00	0.13	1.37
15	ST W8X 31	PASS	SHEAR -Y	0.004	3
		0.04 T	0.00	0.01	1.36
16	ST W8X 31	PASS	SHEAR -Y	0.002	3
		0.03 T	0.00	-0.01	1.37
17	ST W8X 31	PASS	SHEAR -Y	0.001	3
		0.03 T	0.00	-0.01	1.36
18	ST W8X 31	PASS	SHEAR -Y	0.001	3
		0.03 C	0.00	0.01	0.00
19	ST W8X 31	PASS	SHEAR -Y	0.001	3
		0.02 C	0.00	0.01	0.00
20	ST W8X 31	PASS	SHEAR -Y	0.002	3
		0.01 C	0.00	0.01	0.00
21	ST W8X 31	PASS	SHEAR -Y	0.002	3
		0.01 C	0.00	0.01	0.00
22	ST W8X 31	PASS	SHEAR -Y	0.002	3
		0.00 C	0.00	0.01	0.00
23	ST W8X 31	PASS	SHEAR -Y	0.002	3
		0.00 T	0.00	0.01	0.00
24	ST W8X 31	PASS	SHEAR -Y	0.002	3
		0.01 T	0.00	0.01	0.00
25	ST W8X 31	PASS	SHEAR -Y	0.002	3
		0.01 T	0.00	0.01	0.00
26	ST W8X 31	PASS	SHEAR -Y	0.001	3
		0.02 T	0.00	0.01	0.00

ALL UNITS ARE - KIP FEET (UNLESS OTHERWISE NOTED)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
27	ST W8X 31	PASS 0.03 T	SHEAR -Y 0.00	0.001 0.01	3 0.00
28	ST W8X 31	PASS 0.03 T	SHEAR -Y 0.00	0.001 0.01	3 0.00
29	ST W8X 31	PASS 0.03	SHEAR -Y 0.00	0.002 0.01	3 0.00
30	ST W8X 31	PASS 0.04 T	SHEAR -Y 0.00	0.004 -0.01	3 0.00
31	ST W8X 31	PASS 0.04 T	SHEAR -Y 0.00	0.020 -0.13	3 0.00
32	ST W8X 31	PASS 39.96 C	AISC- H1-1 0.00	0.221 -0.97	3 0.00
33	ST W8X 31	PASS 38.43 C	AISC- H1-1 0.00	0.203 -0.29	3 1.36
34	ST W8X 31	PASS 37.13 C	AISC- H1-1 0.00	0.196 -0.28	3 1.36
35	ST W8X 31	PASS 36.28 C	AISC- H1-1 0.00	0.191 -0.27	3 1.37
36	ST W8X 31	PASS 35.92 C	AISC- H1-1 0.00	0.189 -0.24	3 1.36
37	ST W8X 31	PASS 36.06 C	AISC- H1-1 0.00	0.190 0.26	3 1.56
38	ST W8X 31	PASS 36.79 C	AISC- H1-1 0.00	0.195 0.30	3 1.57
39	ST W8X 31	PASS 38.18 C	AISC- H1-1 0.00	0.204 0.40	3 1.56
40	ST W8X 31	PASS 40.50 C	AISC- H1-1 0.00	0.224 0.91	3 1.57
41	ST W8X 31	PASS 45.28 C	AISC- H1-2 0.00	0.320 4.90	3 1.57
42	ST W8X 31	PASS 60.66 C	AISC- H1-2 0.00	0.767 25.00	3 1.31

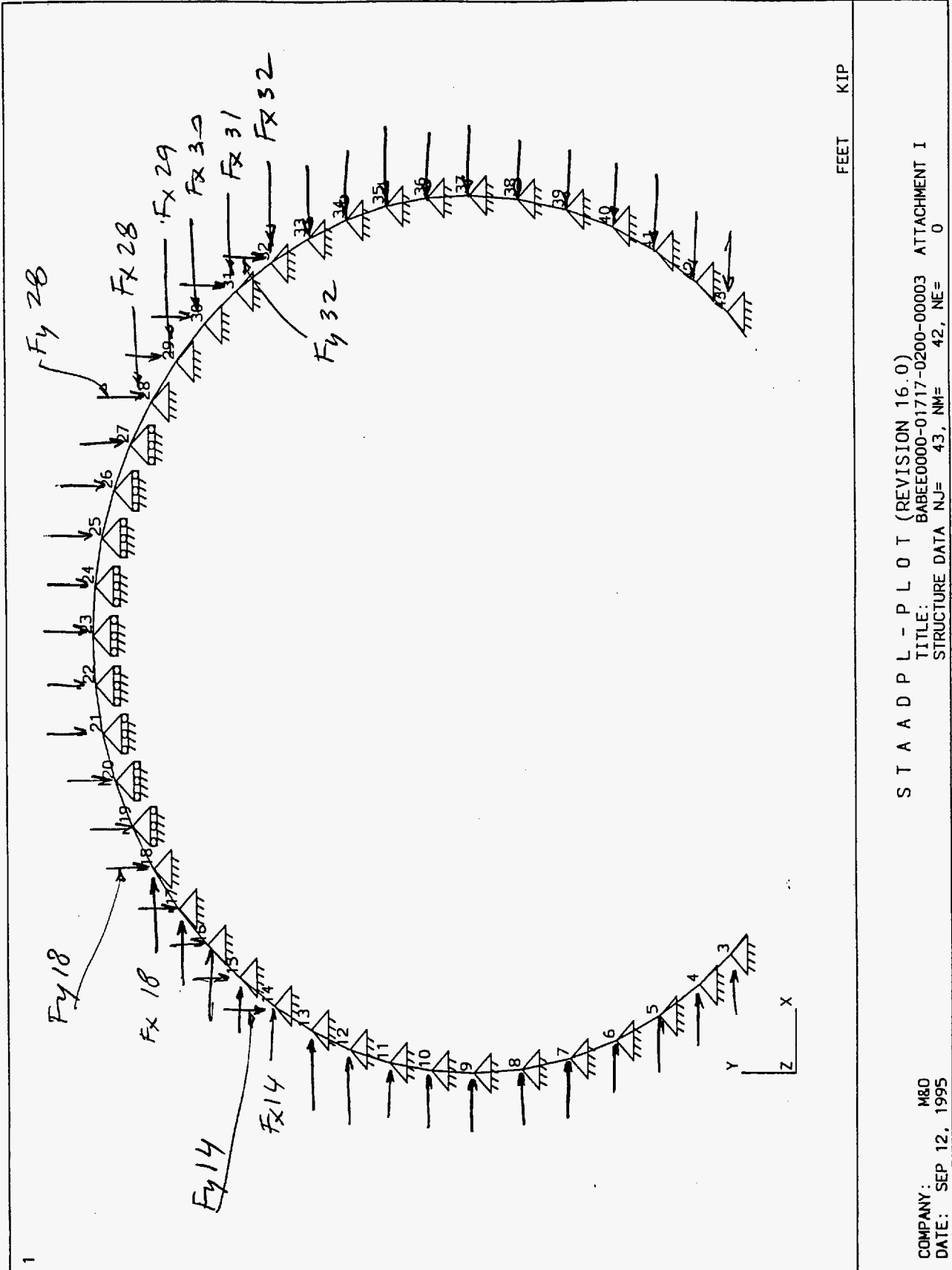
***** END OF TABULATED RESULT OF DESIGN *****

52. PLOT DISPLACEMENT FILE
53. PLOT BENDING FILE
54. FINISH

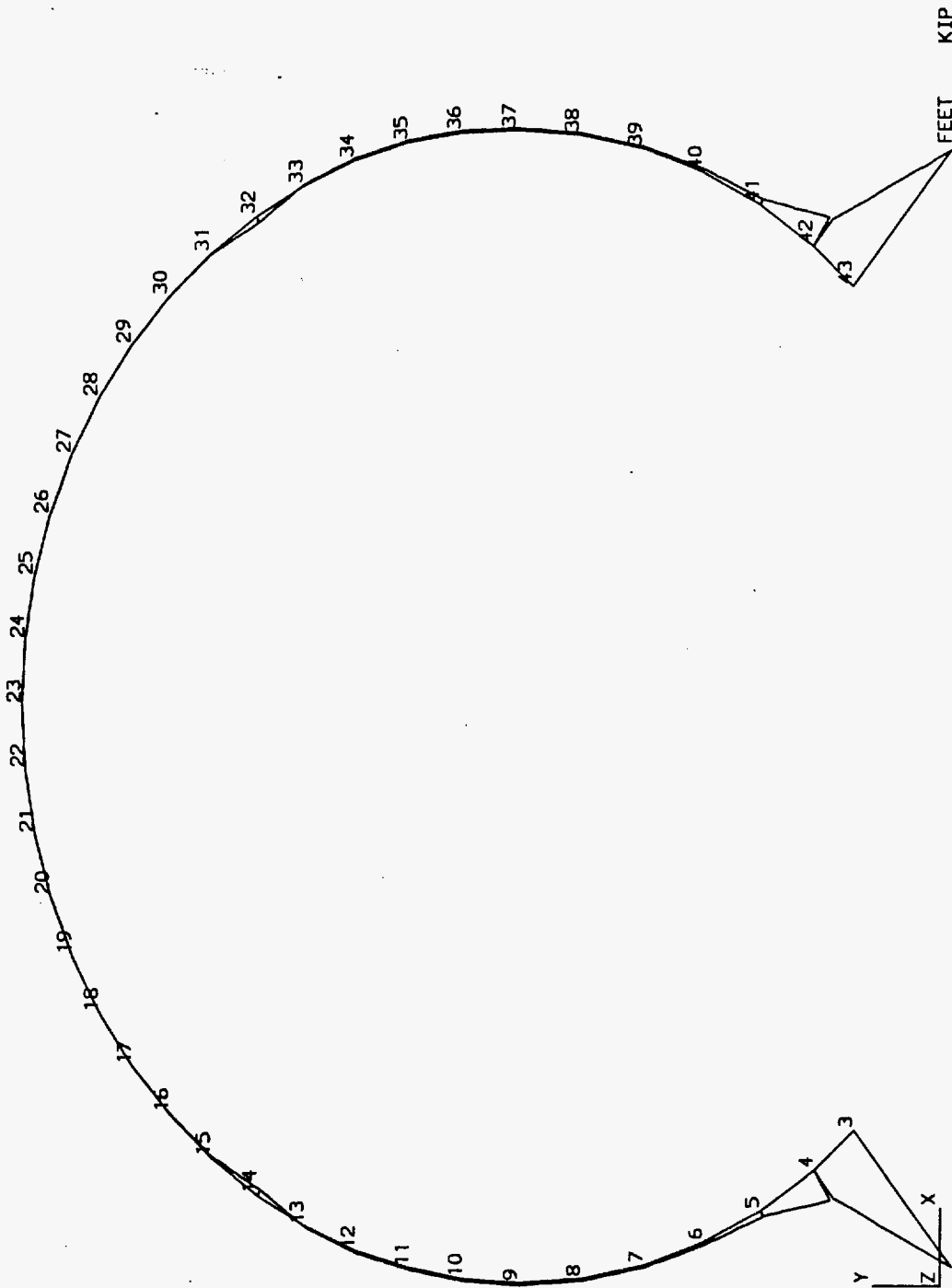
***** END OF STAAD-III *****

DATE= JUL 18,1995 TIME= 11: 3: 7 *****

* For questions on STAAD-III/ISDS, contact: *
* RESEARCH ENGINEERS, Inc at (714) 974-2500 *



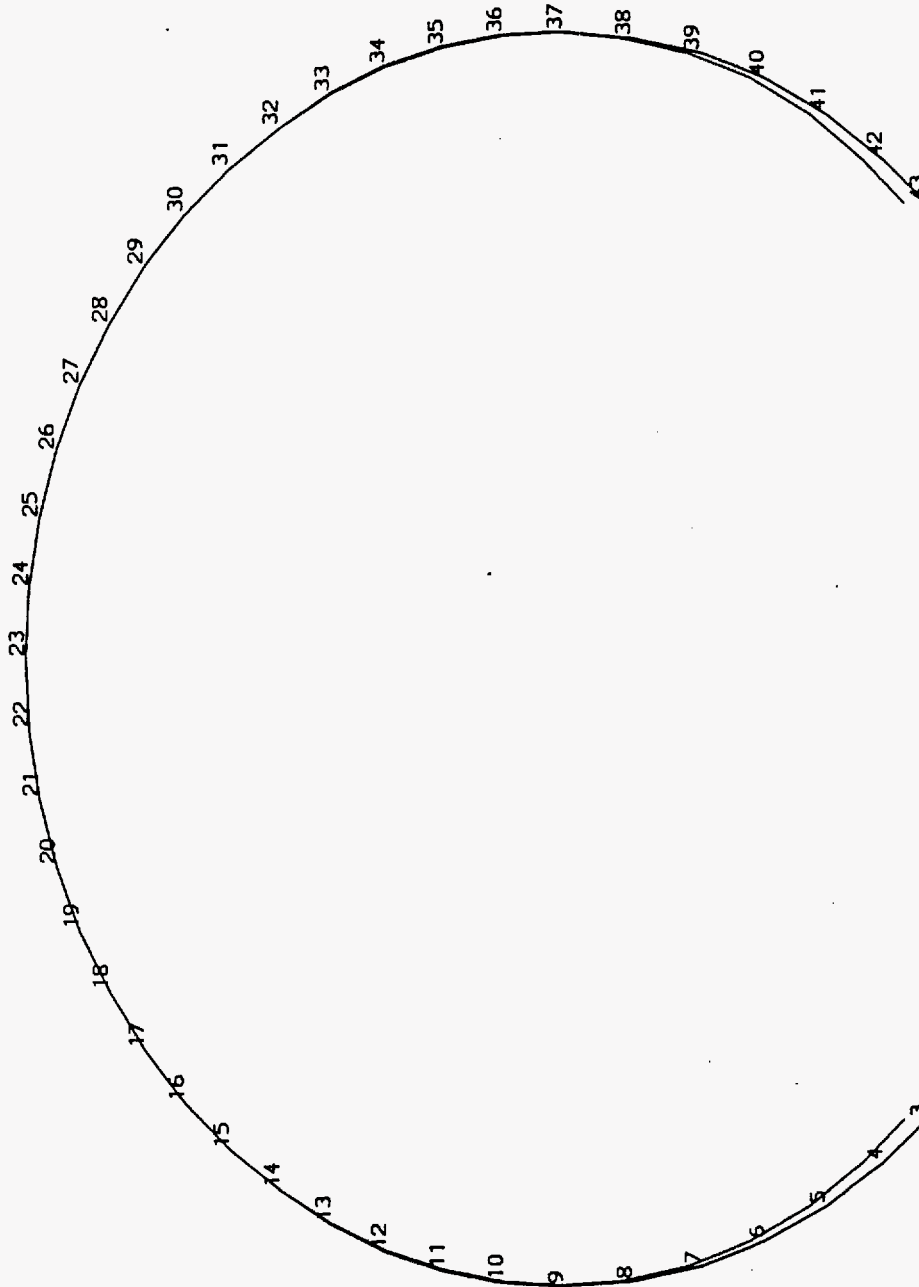
MOMENT MZ LN= 3



STADPL - PLOT (REVISION 16.0) 5722V 3A2
 TITLE: BABEE0000-01717-0200-00003 ATTACHMENT I
 STRUCTURE DATA NJ= 41, NM= 40, NE= 0

COMPANY: M&O
 DATE: JUL 18, 1995

DFDR LOAD= 3



FEET KIP

STADPL - PLOT (REVISION 16.0) STAD 3 A2
 TITLE: BABEE0000-01717-0200-00003 ATTACHMENT I
 STRUCTURE DATA NJ= 41, NM= 40, NE= 0

COMPANY: M&O
 DATE: JUL 18, 1995

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*
*          S T A A D - III
*          Revision 16.0b
*          Proprietary Program of
*          RESEARCH ENGINEERS, Inc.
*          Date=      JUL 18, 1995
*          Time=      7:30: 6
*
*****
```

```
1. STAAD PLANE BABEE0000-01717-0200-00003 ATTACHMENT I
2. * ESF GROUND SUPPORT-STRUCTURAL STEEL ANALYSIS REV 00
3. *
4. * FILE STLVR4
5. * 25 TON JACK APPLIED ONE SIDE @ 47 DEGREES
6. UNIT FT KIP
7. JOINT COORDINATES
8. 3 3.27 2.13 ; 4 2.43 3.13
9. 5 1.58 4.44 ; 6 0.90 5.85 ; 7 0.40 7.33 ; 8 0.10 8.87
10. 9 0.0 10.43 ; 10 0.08 11.79 ; 11 0.31 13.14 ; 12 0.68 14.45
11. 13 1.21 15.71 ; 14 1.86 16.90 ; 15 2.65 18.02 ; 16 3.56 19.03
12. 17 4.58 19.94 ; 18 5.69 20.73 ; 19 6.89 21.39 ; 20 8.15 21.91
13. 21 9.46 22.29 ; 22 10.80 22.52 ; 23 12.17 22.60 ; 24 13.53 22.52
14. 25 14.87 22.29 ; 26 16.18 21.91 ; 27 17.45 21.39 ; 28 18.64 20.73
15. 29 19.75 19.94 ; 30 20.77 19.03 ; 31 21.68 18.02 ; 32 22.47 16.90
16. 33 23.13 15.71 ; 34 23.65 14.45 ; 35 24.03 13.14 ; 36 24.26 11.79
17. 37 24.33 10.43 ; 38 24.23 8.87 ; 39 23.93 7.33 ; 40 23.44 5.85
18. 41 22.76 4.44 ; 42 21.90 3.13 ; 43 20.88 1.94 ; 44 19.72 0.89
19. 45 18.43 0.00
20. MEMBER INCIDENCE
21. 3 3 4 44
22. UNIT KIP INCH
23. MEMBER PROPERTIES
24. 3 TO 44 TA STA W8X31
25. CONSTANTS
26. E 29000.0 ALL
27. DENSITY 0.00028 ALL
28. BETA 0 ALL
29. UNIT FT
30. SUPPORT
31. 3 7 11 35 39 43 FIXED BUT FY MZ
32. 22 24 FIXED BUT FX MZ
33. 16 30 45 PINNED
34. UNIT KIP
35. LOAD 1
36. SELF WEIGHT Y -1.0
37. LOADING 2
38. * 25 TON JACK & ONE SIDED JACKING
39. JOINT LOADING
40. 3 FX -34.1
41. 3 FY 36.57
42. 3 MZ 25.00
43. LOADING COMBINATION 3
44. 1 2.5 2 1.0
45. PERFORM ANALYSIS
```

P R O B L E M S T A T I S T I C S

NUMBER OF JOINTS/MEMBER+ELEMENTS/SUPPORTS = 43/ 42/ 11
ORIGINAL/FINAL BAND-WIDTH = 1/ 1
TOTAL PRIMARY LOAD CASES = 2, TOTAL DEGREES OF FREEDOM = 115
SIZE OF STIFFNESS MATRIX = 690 DOUBLE PREC. WORDS
TOTAL REQUIRED DISK SPACE = 0.08 MEGA-BYTES

++ PROCESSING ELEMENT STIFFNESS MATRIX. 7:30: 9
++ PROCESSING GLOBAL STIFFNESS MATRIX. 7:30:10
++ PROCESSING TRIANGULAR FACTORIZATION. 7:30:10
++ CALCULATING JOINT DISPLACEMENTS. 7:30:10
++ CALCULATING MEMBER FORCES. 7:30:11

46. LOAD LIST 3

47. PRINT ANALYSIS RESULTS

JOINT DISPLACEMENT (INCH RADIAN)

STRUCTURE TYPE = PLANE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
3	3	0.00000	0.06495	0.00000	0.00000	0.00000	0.00341
4	3	-0.03076	0.03557	0.00000	0.00000	0.00000	0.00185
5	3	-0.04196	0.02445	0.00000	0.00000	0.00000	0.00008
6	3	-0.02664	0.02831	0.00000	0.00000	0.00000	-0.00099
7	3	0.00000	0.03408	0.00000	0.00000	0.00000	-0.00073
8	3	0.00247	0.03201	0.00000	0.00000	0.00000	-0.00006
9	3	0.00080	0.02935	0.00000	0.00000	0.00000	0.00004
10	3	0.00077	0.02714	0.00000	0.00000	0.00000	0.00007
11	3	0.00000	0.02505	0.00000	0.00000	0.00000	0.00040
12	3	-0.01365	0.02637	0.00000	0.00000	0.00000	0.00057
13	3	-0.02259	0.02741	0.00000	0.00000	0.00000	0.00016
14	3	-0.02196	0.02423	0.00000	0.00000	0.00000	-0.00044
15	3	-0.01240	0.01443	0.00000	0.00000	0.00000	-0.00088
16	3	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00077
17	3	0.00533	-0.00621	0.00000	0.00000	0.00000	-0.00035
18	3	0.00669	-0.00840	0.00000	0.00000	0.00000	-0.00007
19	3	0.00608	-0.00763	0.00000	0.00000	0.00000	0.00010
20	3	0.00487	-0.00514	0.00000	0.00000	0.00000	0.00016
21	3	0.00384	-0.00221	0.00000	0.00000	0.00000	0.00015
22	3	0.00328	0.00000	0.00000	0.00000	0.00000	0.00008
23	3	0.00307	0.00026	0.00000	0.00000	0.00000	0.00002
24	3	0.00288	0.00000	0.00000	0.00000	0.00000	0.00003
25	3	0.00289	0.00123	0.00000	0.00000	0.00000	0.00006
26	3	0.00302	0.00239	0.00000	0.00000	0.00000	0.00004
27	3	0.00300	0.00288	0.00000	0.00000	0.00000	-0.00001
28	3	0.00253	0.00246	0.00000	0.00000	0.00000	-0.00006
29	3	0.00147	0.00133	0.00000	0.00000	0.00000	-0.00010
30	3	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00009
31	3	-0.00093	-0.00089	0.00000	0.00000	0.00000	-0.00006
32	3	-0.00136	-0.00125	0.00000	0.00000	0.00000	-0.00001
33	3	-0.00124	-0.00122	0.00000	0.00000	0.00000	0.00002
34	3	-0.00068	-0.00102	0.00000	0.00000	0.00000	0.00003
35	3	0.00000	-0.00084	0.00000	0.00000	0.00000	0.00003
36	3	0.00023	-0.00081	0.00000	0.00000	0.00000	0.00001
37	3	0.00023	-0.00081	0.00000	0.00000	0.00000	0.00000
38	3	0.00010	-0.00079	0.00000	0.00000	0.00000	0.00000
39	3	0.00000	-0.00075	0.00000	0.00000	0.00000	0.00000
40	3	0.00027	-0.00081	0.00000	0.00000	0.00000	0.00001
41	3	0.00041	-0.00083	0.00000	0.00000	0.00000	0.00000
42	3	0.00027	-0.00068	0.00000	0.00000	0.00000	-0.00001
43	3	0.00000	-0.00038	0.00000	0.00000	0.00000	-0.00001
44	3	0.00006	-0.00029	0.00000	0.00000	0.00000	-0.00001
45	3	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00001

SUPPORT REACTIONS -UNIT KIP FEET STRUCTURE TYPE = PLANE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
3	3	6.29	0.00	0.00	0.00	0.00	0.00
7	3	28.29	0.00	0.00	0.00	0.00	0.00
11	3	19.23	0.00	0.00	0.00	0.00	0.00
35	3	0.48	0.00	0.00	0.00	0.00	0.00
39	3	-0.41	0.00	0.00	0.00	0.00	0.00
43	3	-0.93	0.00	0.00	0.00	0.00	0.00
22	3	0.00	1.24	0.00	0.00	0.00	0.00
24	3	0.00	-2.05	0.00	0.00	0.00	0.00
16	3	-16.75	-34.69	0.00	0.00	0.00	0.00
30	3	-3.37	2.49	0.00	0.00	0.00	0.00
45	3	1.26	1.03	0.00	0.00	0.00	0.00

MEMBER END FORCES STRUCTURE TYPE = PLANE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
3	3	3	45.89	2.23	0.00	0.00	0.00	-25.00
		4	-45.81	-2.16	0.00	0.00	0.00	27.87
4	3	4	45.73	-3.48	0.00	0.00	0.00	-27.87
		5	-45.63	3.54	0.00	0.00	0.00	22.39
5	3	5	44.82	-9.26	0.00	0.00	0.00	-22.39
		6	-44.71	9.31	0.00	0.00	0.00	7.85
6	3	6	43.22	-14.75	0.00	0.00	0.00	-7.85
		7	-43.11	14.79	0.00	0.00	0.00	-15.22
7	3	7	35.35	7.38	0.00	0.00	0.00	15.22
		8	-35.23	-7.35	0.00	0.00	0.00	-3.66
8	3	8	35.89	2.78	0.00	0.00	0.00	3.66
		9	-35.77	-2.78	0.00	0.00	0.00	0.68
9	3	9	35.84	1.63	0.00	0.00	0.00	0.68
		10	-35.73	-1.62	0.00	0.00	0.00	1.53
10	3	10	35.34	5.53	0.00	0.00	0.00	-1.53
		11	-35.23	-5.51	0.00	0.00	0.00	9.09
11	3	11	39.68	-9.28	0.00	0.00	0.00	-9.09
		12	-39.58	9.31	0.00	0.00	0.00	-3.56
12	3	12	40.42	-4.39	0.00	0.00	0.00	3.56
		13	-40.32	4.43	0.00	0.00	0.00	-9.59
13	3	13	40.56	-0.31	0.00	0.00	0.00	9.59
		14	-40.47	0.36	0.00	0.00	0.00	-10.04
14	3	14	40.25	4.26	0.00	0.00	0.00	10.04
		15	-40.16	-4.20	0.00	0.00	0.00	-4.24
15	3	15	39.38	8.94	0.00	0.00	0.00	4.24
		16	-39.30	-8.87	0.00	0.00	0.00	7.88
16	3	16	2.51	-1.64	0.00	0.00	0.00	-7.88
		17	-2.44	1.72	0.00	0.00	0.00	5.58
17	3	17	2.62	-1.44	0.00	0.00	0.00	-5.58
		18	-2.56	1.53	0.00	0.00	0.00	3.56
18	3	18	2.72	-1.22	0.00	0.00	0.00	-3.56
		19	-2.67	1.31	0.00	0.00	0.00	1.82

MEMBER END FORCES STRUCTURE TYPE = PLANE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
19	3	19	2.80	-1.01	0.00	0.00	0.00	-1.82
		20	-2.76	1.10	0.00	0.00	0.00	0.38
20	3	20	2.86	-0.80	0.00	0.00	0.00	-0.38
		21	-2.83	0.90	0.00	0.00	0.00	-0.77
21	3	21	2.91	-0.58	0.00	0.00	0.00	0.77
		22	-2.90	0.68	0.00	0.00	0.00	-1.62
22	3	22	3.03	0.89	0.00	0.00	0.00	1.62
		23	-3.02	-0.78	0.00	0.00	0.00	-0.48
23	3	23	2.91	1.13	0.00	0.00	0.00	0.48
		24	-2.91	-1.02	0.00	0.00	0.00	0.99
24	3	24	3.13	-0.68	0.00	0.00	0.00	-0.99
		25	-3.15	0.78	0.00	0.00	0.00	0.00
25	3	25	3.21	-0.42	0.00	0.00	0.00	0.00
		26	-3.24	0.52	0.00	0.00	0.00	-0.65
26	3	26	3.28	-0.18	0.00	0.00	0.00	0.65
		27	-3.32	0.27	0.00	0.00	0.00	-0.96
27	3	27	3.33	0.12	0.00	0.00	0.00	0.96
		28	-3.38	-0.03	0.00	0.00	0.00	-0.86
28	3	28	3.36	0.40	0.00	0.00	0.00	0.86
		29	-3.42	-0.32	0.00	0.00	0.00	-0.37
29	3	29	3.36	0.69	0.00	0.00	0.00	0.37
		30	-3.43	-0.61	0.00	0.00	0.00	0.52
30	3	30	-0.76	0.15	0.00	0.00	0.00	-0.52
		31	0.68	-0.08	0.00	0.00	0.00	0.68
31	3	31	-0.69	0.00	0.00	0.00	0.00	-0.68
		32	0.60	0.06	0.00	0.00	0.00	0.64
32	3	32	-0.59	-0.13	0.00	0.00	0.00	-0.64
		33	0.50	0.18	0.00	0.00	0.00	0.43
33	3	33	-0.48	-0.23	0.00	0.00	0.00	-0.43
		34	0.38	0.27	0.00	0.00	0.00	0.09
34	3	34	-0.35	-0.31	0.00	0.00	0.00	-0.09
		35	0.25	0.34	0.00	0.00	0.00	-0.36
35	3	35	-0.13	0.11	0.00	0.00	0.00	0.36
		36	0.02	-0.09	0.00	0.00	0.00	-0.23

MEMBER END FORCES STRUCTURE TYPE = PLANE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
36	3	36	-0.03	0.09	0.00	0.00	0.00	0.23
		37	-0.07	-0.08	0.00	0.00	0.00	-0.11
37	3	37	0.06	-0.09	0.00	0.00	0.00	-0.11
		38	-0.18	0.10	0.00	0.00	0.00	-0.03
38	3	38	0.17	-0.12	0.00	0.00	0.00	0.03
		39	-0.28	0.14	0.00	0.00	0.00	-0.23
39	3	39	0.39	0.22	0.00	0.00	0.00	0.23
		40	-0.51	-0.18	0.00	0.00	0.00	0.08
40	3	40	0.53	0.11	0.00	0.00	0.00	-0.08
		41	-0.63	-0.06	0.00	0.00	0.00	0.21
41	3	41	0.64	-0.02	0.00	0.00	0.00	-0.21
		42	-0.74	0.09	0.00	0.00	0.00	0.12
42	3	42	0.72	-0.18	0.00	0.00	0.00	-0.12
		43	-0.81	0.26	0.00	0.00	0.00	-0.22
43	3	43	1.46	0.26	0.00	0.00	0.00	0.22
		44	-1.54	-0.18	0.00	0.00	0.00	0.12
44	3	44	1.55	-0.03	0.00	0.00	0.00	-0.12
		45	-1.62	0.13	0.00	0.00	0.00	0.00

***** END OF LATEST ANALYSIS RESULT *****

48. CHECK CODE ALL

STAAD-III CODE CHECKING - (AISC)

ALL UNITS ARE - KIP FEET (UNLESS OTHERWISE NOTED)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
3	ST W8X 31	PASS 45.81 C	AISC- H1-2 0.00	0.744 27.87	3 1.31
4	ST W8X 31	PASS 45.73 C	AISC- H1-2 0.00	0.744 -27.87	3 0.00
5	ST W8X 31	PASS 44.82 C	AISC- H1-2 0.00	0.638 -22.39	3 0.00
6	ST W8X 31	PASS 43.11 C	AISC- H1-2 0.00	0.498 -15.22	3 1.56
7	ST W8X 31	PASS 35.35 C	AISC- H1-2 0.00	0.459 15.22	3 0.00
8	ST W8X 31	PASS 35.89 C	AISC- H1-2 0.00	0.249 3.66	3 0.00
9	ST W8X 31	PASS 35.73 C	AISC- H1-2 0.00	0.209 1.53	3 1.36
10	ST W8X 31	PASS 35.23 C	AISC- H1-2 0.00	0.346 9.09	3 1.37
11	ST W8X 31	PASS 39.68 C	AISC- H1-2 0.00	0.368 -9.09	3 0.00
12	ST W8X 31	PASS 40.32 C	AISC- H1-2 0.00	0.381 -9.59	3 1.37
13	ST W8X 31	PASS 40.47 C	AISC- H1-2 0.00	0.390 -10.04	3 1.36
14	ST W8X 31	PASS 40.25 C	AISC- H1-2 0.00	0.388 10.04	3 0.00
15	ST W8X 31	PASS 39.30 C	AISC- H1-2 0.00	0.344 7.88	3 1.36
16	ST W8X 31	PASS 2.51 C	AISC- H1-3 0.00	0.158 -7.88	3 0.00
17	ST W8X 31	PASS 2.62 C	AISC- H1-3 0.00	0.116 -5.58	3 0.00
18	ST W8X 31	PASS 2.72 C	AISC- H1-3 0.00	0.079 -3.56	3 0.00
19	ST W8X 31	PASS 2.80 C	AISC- H1-3 0.00	0.048 -1.82	3 0.00
20	ST W8X 31	PASS 2.83 C	AISC- H1-3 0.00	0.029 -0.77	3 1.36
21	ST W8X 31	PASS 2.90 C	AISC- H1-3 0.00	0.045 -1.62	3 1.36
22	ST W8X 31	PASS 3.03 C	AISC- H1-3 0.00	0.045 1.62	3 0.00
23	ST W8X 31	PASS 2.91 C	SHEAR -Y 0.00	0.034 0.48	3 0.00
24	ST W8X 31	PASS 3.13 C	AISC- H1-3 0.00	0.034 -0.99	3 0.00
25	ST W8X 31	PASS 3.24 C	AISC- H1-3 0.00	0.029 -0.65	3 1.36
26	ST W8X 31	PASS 3.32 C	AISC- H1-3 0.00	0.035 -0.96	3 1.37

ALL UNITS ARE - KIP FEET (UNLESS OTHERWISE NOTED)

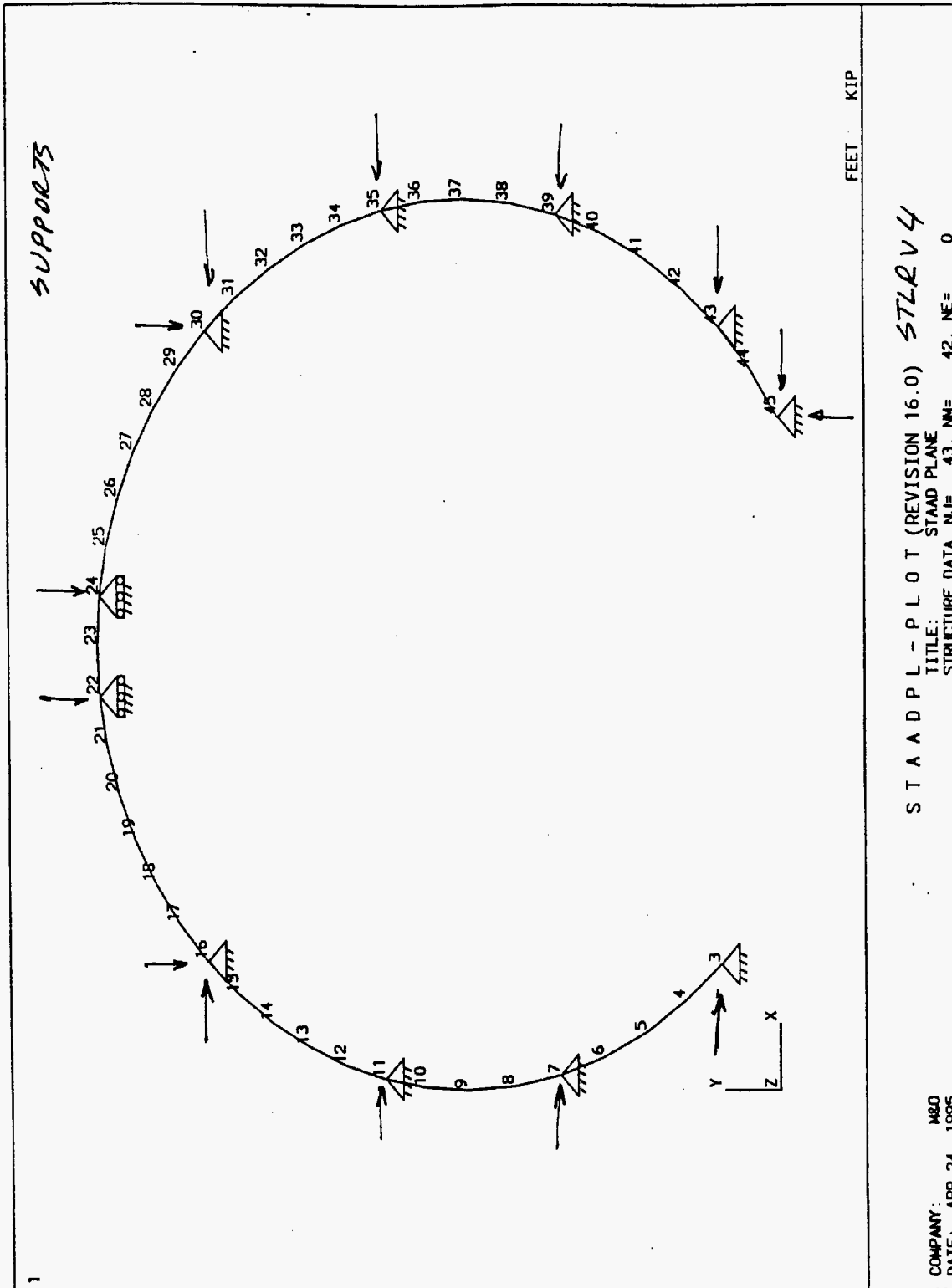
MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
=====					
27	ST W8X 31	PASS	AISC- H1-3	0.035	3
		3.33 C	0.00	0.96	0.00
28	ST W8X 31	PASS	AISC- H1-3	0.033	3
		3.36 C	0.00	0.86	0.00
29	ST W8X 31	PASS	AISC- H1-3	0.027	3
		3.43 C	0.00	0.52	1.37
30	ST W8X 31	PASS	AISC- H2-1	0.016	3
		0.68 T	0.00	0.68	1.36
31	ST W8X 31	PASS	AISC- H2-1	0.016	3
		0.69 T	0.00	-0.68	0.00
32	ST W8X 31	PASS	AISC- H2-1	0.015	3
		0.59 T	0.00	-0.64	0.00
33	ST W8X 31	PASS	AISC- H2-1	0.010	3
		0.48 T	0.00	-0.43	0.00
34	ST W8X 31	PASS	SHEAR -Y	0.010	3
		0.25 T	0.00	-0.36	1.36
35	ST W8X 31	PASS	AISC- H2-1	0.007	3
		0.13 T	0.00	0.36	0.00
36	ST W8X 31	PASS	AISC- H2-1	0.004	3
		0.03 T	0.00	0.23	0.00
37	ST W8X 31	PASS	SHEAR -Y	0.003	3
		0.18 C	0.00	-0.03	1.56
38	ST W8X 31	PASS	AISC- H1-3	0.006	3
		0.28 C	0.00	-0.23	1.57
39	ST W8X 31	PASS	SHEAR -Y	0.007	3
		0.39 C	0.00	0.23	0.00
40	ST W8X 31	PASS	AISC- H1-3	0.007	3
		0.63 C	0.00	0.21	1.57
41	ST W8X 31	PASS	AISC- H1-3	0.007	3
		0.64 C	0.00	-0.21	0.00
42	ST W8X 31	PASS	AISC- H1-3	0.008	3
		0.81 C	0.00	-0.22	1.57
43	ST W8X 31	PASS	AISC- H1-3	0.012	3
		1.46 C	0.00	0.22	0.00
44	ST W8X 31	PASS	AISC- H1-3	0.010	3
		1.55 C	0.00	-0.12	0.00

***** END OF TABULATED RESULT OF DESIGN *****

49. PLOT DISPLACEMENT FILE
50. PLOT BENDING FILE
51. FINISH

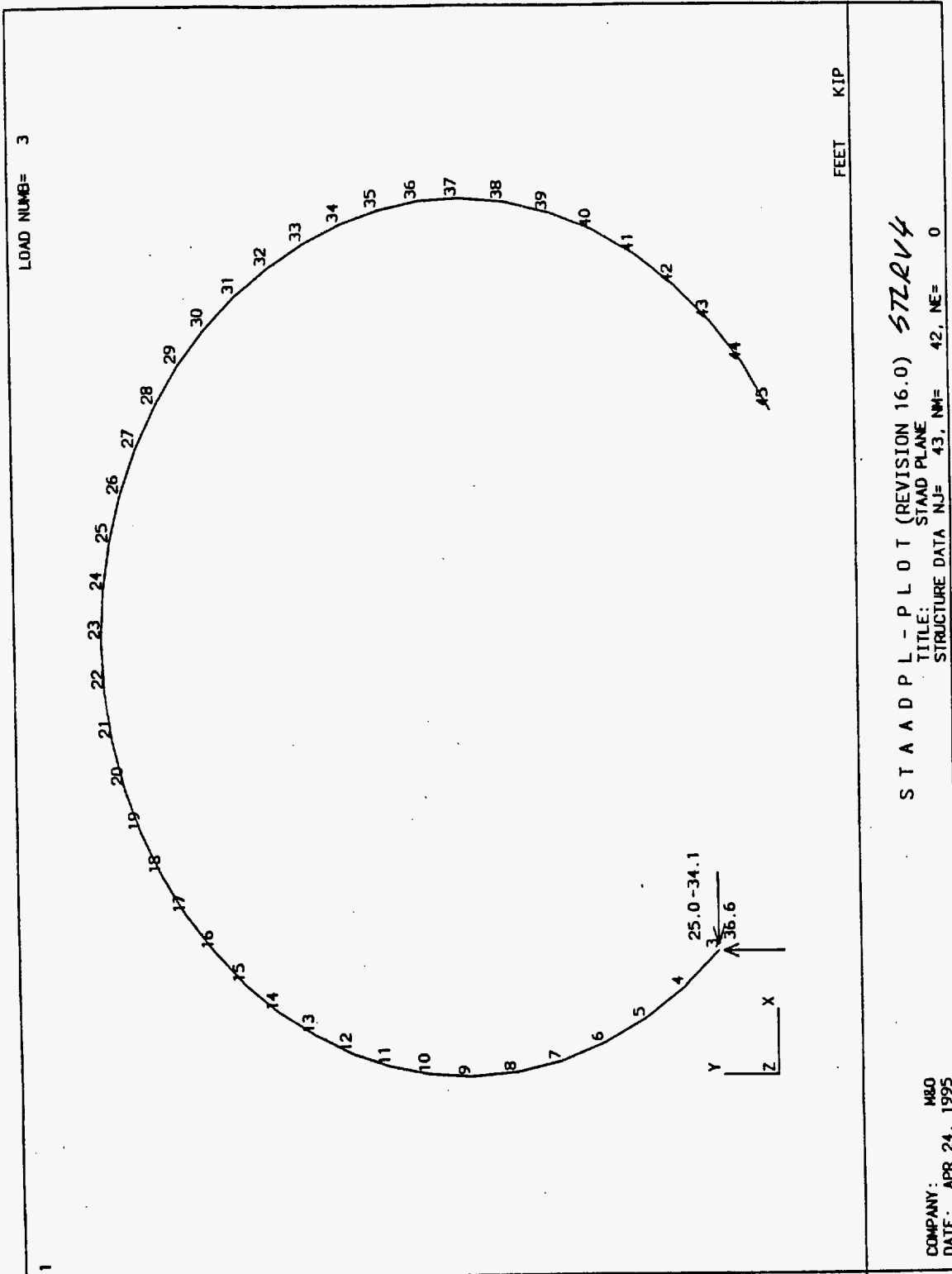
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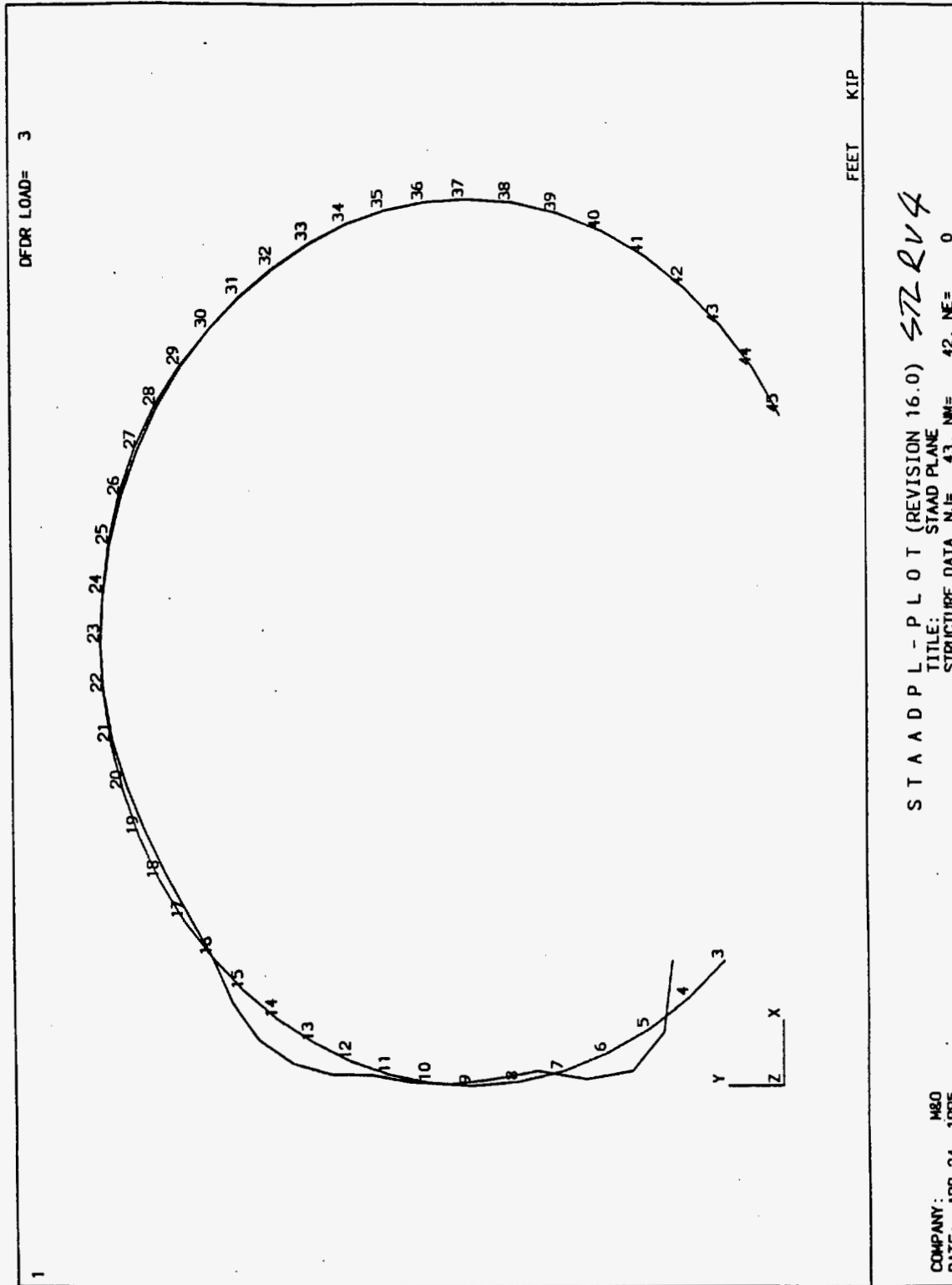
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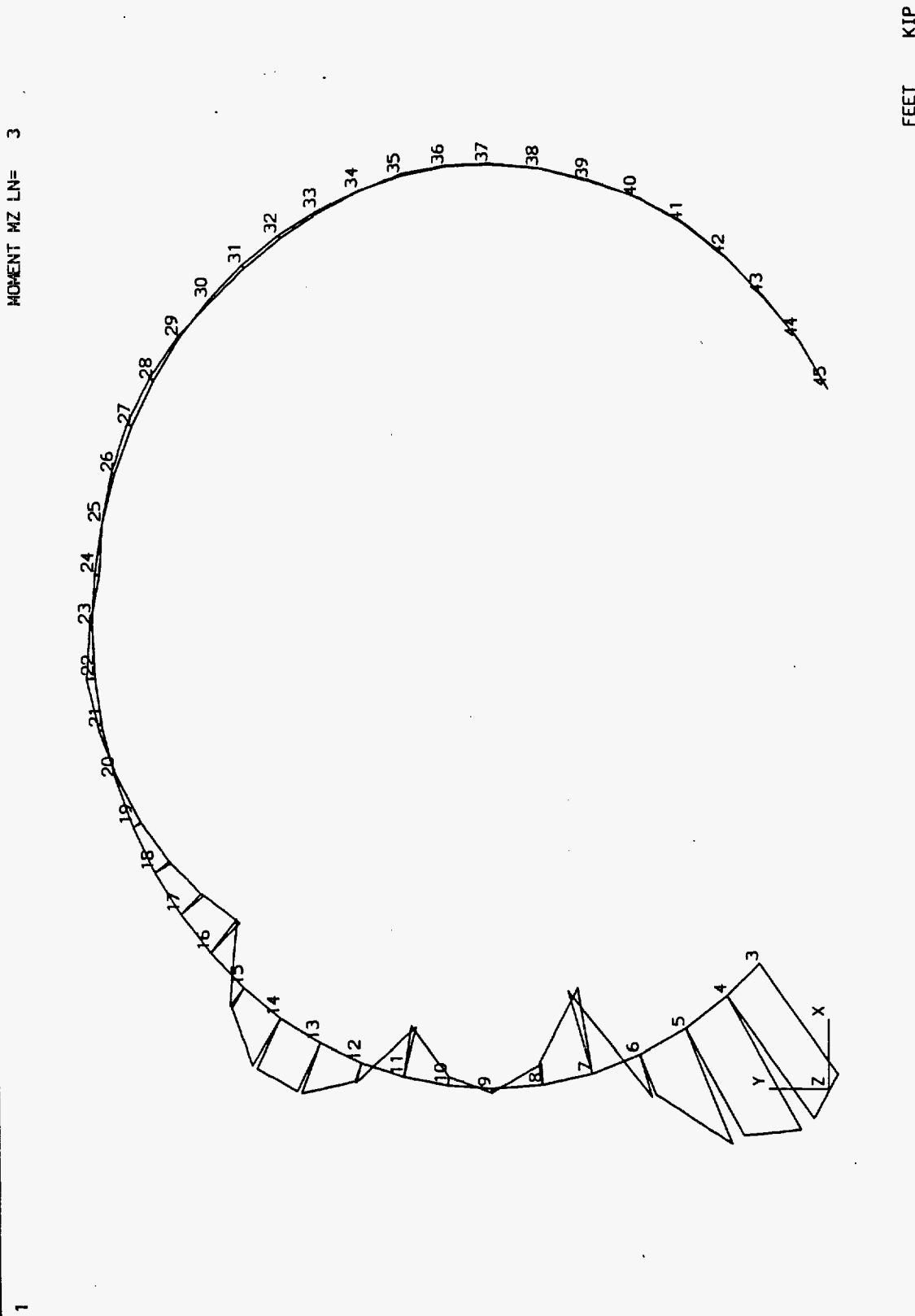


STAD PL - PLOT (REVISION 16.0) STLRV4
 TITLE: STAAD PLANE
 STRUCTURE DATA NJ= 43, NM= 42, NE= 0

COMPANY: M&O
 DATE: APR 24, 1995







STADPL - PLOT (REVISION 16.0)

TITLE: BABEE0000-01717-0200-00003 ATTACHMENT I
STRUCTURE DATA NJ= 43, NW= 42, NE= 0

COMPANY: M80
DATE: JUL 18, 1995

```
*****
*
*          S T A A D - III
*          Revision 16.0b
*          Proprietary Program of
*          RESEARCH ENGINEERS, Inc.
*          Date=      JUL 18, 1995
*          Time=      7:58:50
*
*****
```

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1. STAAD PLANE  BABEE0000-01717-0200-00003  ATTACHMENT  I
2. * ESF GROUND SUPPORT-STRUCTURAL STEEL ANALYSIS REV 00
3. *
4. * FILE STLRV4A
5. * 25 TON JACK APPLIED ONE SIDE @ 49 DEGREES
6. UNIT FT KIP
7. JOINT COORDINATES
8. 3 2.98 2.45 ; 4 2.43 3.13
9. 5 1.58 4.44 ; 6 0.90 5.85 ; 7 0.40 7.33 ; 8 0.10 8.87
10. 9 0.0 10.43 ; 10 0.08 11.79 ; 11 0.31 13.14 ; 12 0.68 14.45
11. 13 1.21 15.71 ; 14 1.86 16.90 ; 15 2.65 18.02 ; 16 3.56 19.03
12. 17 4.58 19.94 ; 18 5.69 20.73 ; 19 6.89 21.39 ; 20 8.15 21.91
13. 21 9.46 22.29 ; 22 10.80 22.52 ; 23 12.17 22.60 ; 24 13.53 22.52
14. 25 14.87 22.29 ; 26 16.18 21.91 ; 27 17.45 21.39 ; 28 18.64 20.73
15. 29 19.75 19.94 ; 30 20.77 19.03 ; 31 21.68 18.02 ; 32 22.47 16.90
16. 33 23.13 15.71 ; 34 23.65 14.45 ; 35 24.03 13.14 ; 36 24.26 11.79
17. 37 24.33 10.43 ; 38 24.23 8.87 ; 39 23.93 7.33 ; 40 23.44 5.85
18. 41 22.76 4.44 ; 42 21.90 3.13 ; 43 20.88 1.94 ; 44 19.72 0.89
19. 45 18.43 0.00
20. MEMBER INCIDENCE
21. 3 3 4 44
22. UNIT KIP INCH
23. MEMBER PROPERTIES
24. 3 TO 44 TA STA W8X31
25. CONSTANTS
26. E 29000.0 ALL
27. DENSITY 0.00028 ALL
28. BETA 0 ALL
29. UNIT FT
30. SUPPORT
31. 3 7 11 35 39 43 FIXED BUT FY MZ
32. 22 24 FIXED BUT FX MZ
33. 16 30 45 PINNED
34. UNIT KIP
35. LOAD 1
36. SELF WEIGHT Y -1.0
37. LOADING 2
38. * 25 TON JACK & ONE SIDED JACKING
39. JOINT LOADING
40. 3 FX -32.80
41. 3 FY 37.74
42. 3 MZ 25.00
43. LOADING COMBINATION 3
44. 1 2.5 2 1.0
```

46. LOAD LIST 3
47. PRINT ANALYSIS RESULTS

JOINT DISPLACEMENT (INCH RADIANS)

STRUCTURE TYPE = PLANE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
3	3	0.00000	0.06126	0.00000	0.00000	0.00000	0.00306
4	3	-0.02016	0.04257	0.00000	0.00000	0.00000	0.00203
5	3	-0.03492	0.02905	0.00000	0.00000	0.00000	0.00030
6	3	-0.02348	0.03095	0.00000	0.00000	0.00000	-0.00079
7	3	0.00000	0.03557	0.00000	0.00000	0.00000	-0.00060
8	3	0.00097	0.03312	0.00000	0.00000	0.00000	-0.00002
9	3	-0.00074	0.03038	0.00000	0.00000	0.00000	0.00002
10	3	-0.00004	0.02805	0.00000	0.00000	0.00000	0.00003
11	3	0.00000	0.02575	0.00000	0.00000	0.00000	0.00037
12	3	-0.01379	0.02701	0.00000	0.00000	0.00000	0.00057
13	3	-0.02296	0.02807	0.00000	0.00000	0.00000	0.00017
14	3	-0.02241	0.02483	0.00000	0.00000	0.00000	-0.00045
15	3	-0.01268	0.01480	0.00000	0.00000	0.00000	-0.00090
16	3	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00079
17	3	0.00545	-0.00635	0.00000	0.00000	0.00000	-0.00036
18	3	0.00685	-0.00859	0.00000	0.00000	0.00000	-0.00007
19	3	0.00622	-0.00780	0.00000	0.00000	0.00000	0.00010
20	3	0.00498	-0.00526	0.00000	0.00000	0.00000	0.00017
21	3	0.00392	-0.00226	0.00000	0.00000	0.00000	0.00016
22	3	0.00335	0.00000	0.00000	0.00000	0.00000	0.00008
23	3	0.00314	0.00026	0.00000	0.00000	0.00000	0.00002
24	3	0.00294	0.00000	0.00000	0.00000	0.00000	0.00003
25	3	0.00296	0.00126	0.00000	0.00000	0.00000	0.00006
26	3	0.00309	0.00245	0.00000	0.00000	0.00000	0.00004
27	3	0.00307	0.00295	0.00000	0.00000	0.00000	-0.00001
28	3	0.00259	0.00252	0.00000	0.00000	0.00000	-0.00006
29	3	0.00151	0.00137	0.00000	0.00000	0.00000	-0.00010
30	3	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00010
31	3	-0.00094	-0.00091	0.00000	0.00000	0.00000	-0.00006
32	3	-0.00138	-0.00127	0.00000	0.00000	0.00000	-0.00001
33	3	-0.00125	-0.00123	0.00000	0.00000	0.00000	0.00002
34	3	-0.00069	-0.00103	0.00000	0.00000	0.00000	0.00004
35	3	0.00000	-0.00085	0.00000	0.00000	0.00000	0.00003
36	3	0.00023	-0.00081	0.00000	0.00000	0.00000	0.00001
37	3	0.00024	-0.00081	0.00000	0.00000	0.00000	0.00000
38	3	0.00010	-0.00079	0.00000	0.00000	0.00000	-0.00001
39	3	0.00000	-0.00076	0.00000	0.00000	0.00000	0.00000
40	3	0.00027	-0.00081	0.00000	0.00000	0.00000	0.00001
41	3	0.00041	-0.00083	0.00000	0.00000	0.00000	0.00000
42	3	0.00027	-0.00069	0.00000	0.00000	0.00000	-0.00001
43	3	0.00000	-0.00038	0.00000	0.00000	0.00000	-0.00001
44	3	0.00006	-0.00029	0.00000	0.00000	0.00000	-0.00001
45	3	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00001

SUPPORT REACTIONS -UNIT KIP FEET STRUCTURE TYPE = PLANE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
3	3	4.97	0.00	0.00	0.00	0.00	0.00
7	3	27.95	0.00	0.00	0.00	0.00	0.00
11	3	20.34	0.00	0.00	0.00	0.00	0.00
35	3	0.48	0.00	0.00	0.00	0.00	0.00
39	3	-0.42	0.00	0.00	0.00	0.00	0.00
43	3	-0.94	0.00	0.00	0.00	0.00	0.00
22	3	0.00	1.26	0.00	0.00	0.00	0.00
24	3	0.00	-2.10	0.00	0.00	0.00	0.00
16	3	-17.43	-35.89	0.00	0.00	0.00	0.00
30	3	-3.43	2.52	0.00	0.00	0.00	0.00
45	3	1.27	1.03	0.00	0.00	0.00	0.00

MEMBER END FORCES STRUCTURE TYPE = PLANE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
3	3	3	46.85	2.09	0.00	0.00	0.00	-25.00
		4	-46.79	-2.05	0.00	0.00	0.00	26.81
4	3	4	46.75	-2.84	0.00	0.00	0.00	-26.81
		5	-46.65	2.91	0.00	0.00	0.00	22.32
5	3	5	45.91	-8.76	0.00	0.00	0.00	-22.32
		6	-45.81	8.81	0.00	0.00	0.00	8.58
6	3	6	44.37	-14.39	0.00	0.00	0.00	-8.58
		7	-44.26	14.42	0.00	0.00	0.00	-13.93
7	3	7	36.60	7.25	0.00	0.00	0.00	13.93
		8	-36.48	-7.23	0.00	0.00	0.00	-2.56
8	3	8	37.11	2.50	0.00	0.00	0.00	2.56
		9	-36.99	-2.49	0.00	0.00	0.00	1.34
9	3	9	37.02	2.06	0.00	0.00	0.00	1.34
		10	-36.91	-2.05	0.00	0.00	0.00	1.46
10	3	10	36.46	6.09	0.00	0.00	0.00	-1.46
		11	-36.36	-6.07	0.00	0.00	0.00	9.78
11	3	11	41.04	-9.67	0.00	0.00	0.00	-9.78
		12	-40.94	9.70	0.00	0.00	0.00	-3.41
12	3	12	41.82	-4.61	0.00	0.00	0.00	3.41
		13	-41.72	4.65	0.00	0.00	0.00	-9.74
13	3	13	41.98	-0.39	0.00	0.00	0.00	9.74
		14	-41.89	0.44	0.00	0.00	0.00	-10.30
14	3	14	41.66	4.34	0.00	0.00	0.00	10.30
		15	-41.58	-4.28	0.00	0.00	0.00	-4.38
15	3	15	40.77	9.19	0.00	0.00	0.00	4.38
		16	-40.70	-9.12	0.00	0.00	0.00	8.07
16	3	16	2.56	-1.68	0.00	0.00	0.00	-8.07
		17	-2.49	1.76	0.00	0.00	0.00	5.71
17	3	17	2.67	-1.48	0.00	0.00	0.00	-5.71
		18	-2.61	1.56	0.00	0.00	0.00	3.64
18	3	18	2.77	-1.25	0.00	0.00	0.00	-3.64
		19	-2.72	1.34	0.00	0.00	0.00	1.86

MEMBER END FORCES STRUCTURE TYPE = PLANE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
19	3	19	2.85	-1.03	0.00	0.00	0.00	-1.86
		20	-2.81	1.13	0.00	0.00	0.00	0.39
20	3	20	2.92	-0.82	0.00	0.00	0.00	-0.39
		21	-2.89	0.92	0.00	0.00	0.00	-0.79
21	3	21	2.98	-0.59	0.00	0.00	0.00	0.79
		22	-2.96	0.69	0.00	0.00	0.00	-1.66
22	3	22	3.09	0.90	0.00	0.00	0.00	1.66
		23	-3.08	-0.80	0.00	0.00	0.00	-0.49
23	3	23	2.97	1.15	0.00	0.00	0.00	0.49
		24	-2.98	-1.05	0.00	0.00	0.00	1.01
24	3	24	3.20	-0.70	0.00	0.00	0.00	-1.01
		25	-3.21	0.80	0.00	0.00	0.00	-0.01
25	3	25	3.28	-0.44	0.00	0.00	0.00	0.01
		26	-3.31	0.54	0.00	0.00	0.00	-0.67
26	3	26	3.35	-0.18	0.00	0.00	0.00	0.67
		27	-3.39	0.28	0.00	0.00	0.00	-0.99
27	3	27	3.40	0.12	0.00	0.00	0.00	0.99
		28	-3.45	-0.03	0.00	0.00	0.00	-0.88
28	3	28	3.43	0.42	0.00	0.00	0.00	0.88
		29	-3.49	-0.33	0.00	0.00	0.00	-0.37
29	3	29	3.43	0.71	0.00	0.00	0.00	0.37
		30	-3.50	-0.63	0.00	0.00	0.00	0.54
30	3	30	-0.76	0.15	0.00	0.00	0.00	-0.54
		31	0.68	-0.08	0.00	0.00	0.00	0.70
31	3	31	-0.69	-0.01	0.00	0.00	0.00	-0.70
		32	0.60	0.07	0.00	0.00	0.00	0.65
32	3	32	-0.59	-0.13	0.00	0.00	0.00	-0.65
		33	0.50	0.18	0.00	0.00	0.00	0.44
33	3	33	-0.47	-0.24	0.00	0.00	0.00	-0.44
		34	0.38	0.28	0.00	0.00	0.00	0.09
34	3	34	-0.35	-0.32	0.00	0.00	0.00	-0.09
		35	0.24	0.34	0.00	0.00	0.00	-0.36
35	3	35	-0.12	0.11	0.00	0.00	0.00	0.36
		36	0.02	-0.09	0.00	0.00	0.00	-0.23

MEMBER END FORCES STRUCTURE TYPE = PLANE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
36	3	36	-0.03	0.09	0.00	0.00	0.00	0.23
		37	-0.07	-0.08	0.00	0.00	0.00	-0.12
37	3	37	0.07	-0.09	0.00	0.00	0.00	-0.12
		38	-0.18	0.10	0.00	0.00	0.00	-0.03
38	3	38	0.17	-0.12	0.00	0.00	0.00	0.03
		39	-0.29	0.14	0.00	0.00	0.00	-0.23
39	3	39	0.40	0.22	0.00	0.00	0.00	0.23
		40	-0.51	-0.18	0.00	0.00	0.00	0.08
40	3	40	0.53	0.11	0.00	0.00	0.00	-0.08
		41	-0.64	-0.06	0.00	0.00	0.00	0.21
41	3	41	0.64	-0.02	0.00	0.00	0.00	-0.21
		42	-0.74	0.09	0.00	0.00	0.00	0.13
42	3	42	0.73	-0.18	0.00	0.00	0.00	-0.13
		43	-0.82	0.26	0.00	0.00	0.00	-0.22
43	3	43	1.47	0.27	0.00	0.00	0.00	0.22
		44	-1.55	-0.18	0.00	0.00	0.00	0.12
44	3	44	1.56	-0.03	0.00	0.00	0.00	-0.12
		45	-1.63	0.13	0.00	0.00	0.00	0.00

***** END OF LATEST ANALYSIS RESULT *****

48. CHECK CODE ALL

STAAD-III CODE CHECKING - (AISC)

ALL UNITS ARE - KIP FEET (UNLESS OTHERWISE NOTED)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
=====					
3	ST W8X 31	PASS	AISC- H1-2	0.730	3
		46.79 C	0.00	26.81	0.87
4	ST W8X 31	PASS	AISC- H1-2	0.730	3
		46.75 C	0.00	-26.81	0.00
5	ST W8X 31	PASS	AISC- H1-2	0.643	3
		45.91 C	0.00	-22.32	0.00
6	ST W8X 31	PASS	AISC- H1-2	0.480	3
		44.26 C	0.00	-13.93	1.56
7	ST W8X 31	PASS	AISC- H1-2	0.441	3
		36.60 C	0.00	13.93	0.00
8	ST W8X 31	PASS	AISC- H1-2	0.235	3
		37.11 C	0.00	2.56	0.00
9	ST W8X 31	PASS	AISC- H1-2	0.214	3
		36.91 C	0.00	1.46	1.36
10	ST W8X 31	PASS	AISC- H1-2	0.364	3
		36.36 C	0.00	9.78	1.37
11	ST W8X 31	PASS	AISC- H1-2	0.388	3
		41.04 C	0.00	-9.78	0.00
12	ST W8X 31	PASS	AISC- H1-2	0.390	3
		41.72 C	0.00	-9.74	1.37
13	ST W8X 31	PASS	AISC- H1-2	0.401	3
		41.89 C	0.00	-10.30	1.36
14	ST W8X 31	PASS	AISC- H1-2	0.400	3
		41.66 C	0.00	10.30	0.00
15	ST W8X 31	PASS	AISC- H1-2	0.355	3
		40.70 C	0.00	8.07	1.36
16	ST W8X 31	PASS	AISC- H1-3	0.161	3
		2.56 C	0.00	-8.07	0.00
17	ST W8X 31	PASS	AISC- H1-3	0.119	3
		2.67 C	0.00	-5.71	0.00
18	ST W8X 31	PASS	AISC- H1-3	0.081	3
		2.77 C	0.00	-3.64	0.00
19	ST W8X 31	PASS	AISC- H1-3	0.049	3
		2.85 C	0.00	-1.86	0.00
20	ST W8X 31	PASS	AISC- H1-3	0.029	3
		2.89 C	0.00	-0.79	1.36
21	ST W8X 31	PASS	AISC- H1-3	0.046	3
		2.96 C	0.00	-1.66	1.36
22	ST W8X 31	PASS	AISC- H1-3	0.046	3
		3.09 C	0.00	1.66	0.00
23	ST W8X 31	PASS	SHEAR -Y	0.035	3
		2.97 C	0.00	0.49	0.00
24	ST W8X 31	PASS	AISC- H1-3	0.035	3
		3.20 C	0.00	-1.01	0.00
25	ST W8X 31	PASS	AISC- H1-3	0.029	3
		3.31 C	0.00	-0.67	1.36
26	ST W8X 31	PASS	AISC- H1-3	0.036	3
		3.39 C	0.00	-0.99	1.37

ALL UNITS ARE - KIP FEET (UNLESS OTHERWISE NOTED)

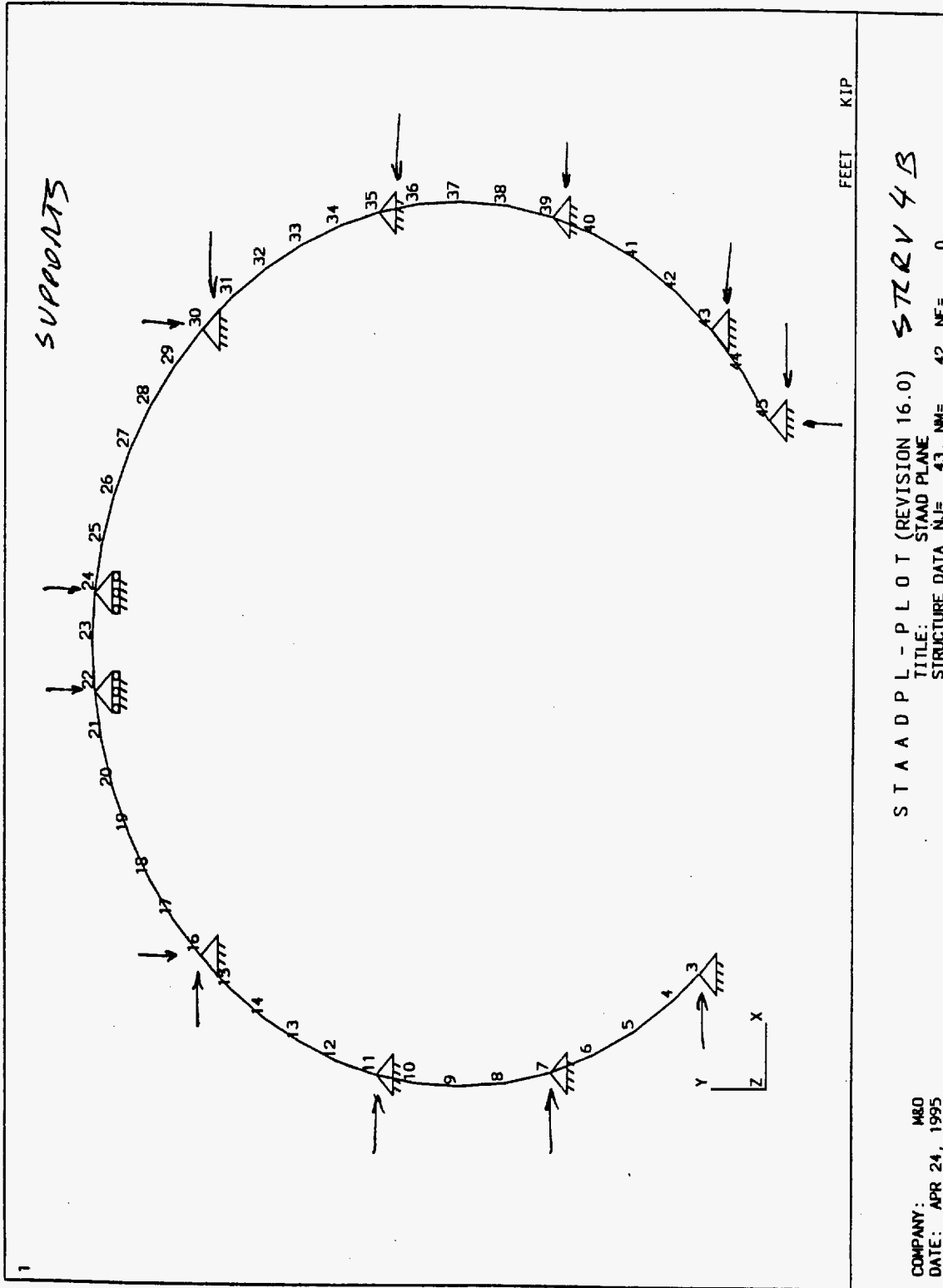
MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
27	ST W8X 31	PASS 3.40 C	AISC- H1-3 0.00	0.036 0.99	3 0.00
28	ST W8X 31	PASS 3.43 C	AISC- H1-3 0.00	0.034 0.88	3 0.00
29	ST W8X 1	PASS 3.50 C	AISC- H1-3 0.00	0.028 0.54	3 1.37
30	ST W8X 31	PASS 0.68 T	AISC- H2-1 0.00	0.016 0.70	3 1.36
31	ST W8X 31	PASS 0.69 T	AISC- H2-1 0.00	0.016 -0.70	3 0.00
32	ST W8X 31	PASS 0.59 T	AISC- H2-1 0.00	0.015 -0.65	3 0.00
33	ST W8X 31	PASS 0.47 T	AISC- H2-1 0.00	0.010 -0.44	3 0.00
34	ST W8X 31	PASS 0.24 T	SHEAR -Y 0.00	0.011 -0.36	3 1.36
35	ST W8X 31	PASS 0.12 T	AISC- H2-1 0.00	0.007 0.36	3 0.00
36	ST W8X 31	PASS 0.03 T	AISC- H2-1 0.00	0.004 0.23	3 0.00
37	ST W8X 31	PASS 0.18 C	SHEAR -Y 0.00	0.003 -0.03	3 1.56
38	ST W8X 31	PASS 0.29 C	AISC- H1-3 0.00	0.006 -0.23	3 1.57
39	ST W8X 31	PASS 0.40 C	SHEAR -Y 0.00	0.007 0.23	3 0.00
40	ST W8X 31	PASS 0.64 C	AISC- H1-3 0.00	0.007 0.21	3 1.57
41	ST W8X 31	PASS 0.64 C	AISC- H1-3 0.00	0.007 -0.21	3 0.00
42	ST W8X 31	PASS 0.82 C	AISC- H1-3 0.00	0.008 -0.22	3 1.57
43	ST W8X 31	PASS 1.47 C	AISC- H1-3 0.00	0.012 0.22	3 0.00
44	ST W8X 31	PASS 1.56 C	AISC- H1-3 0.00	0.010 -0.12	3 0.00

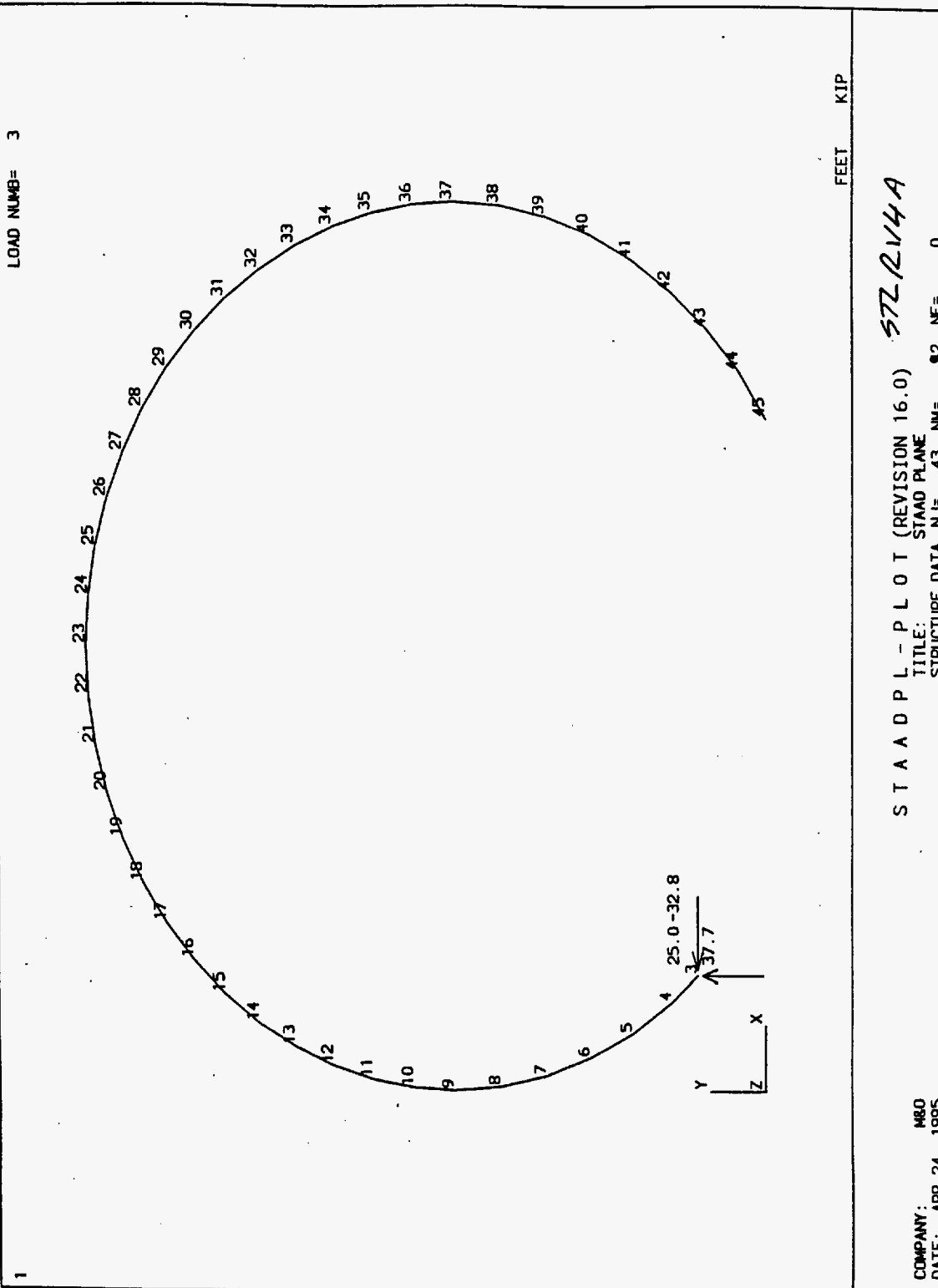
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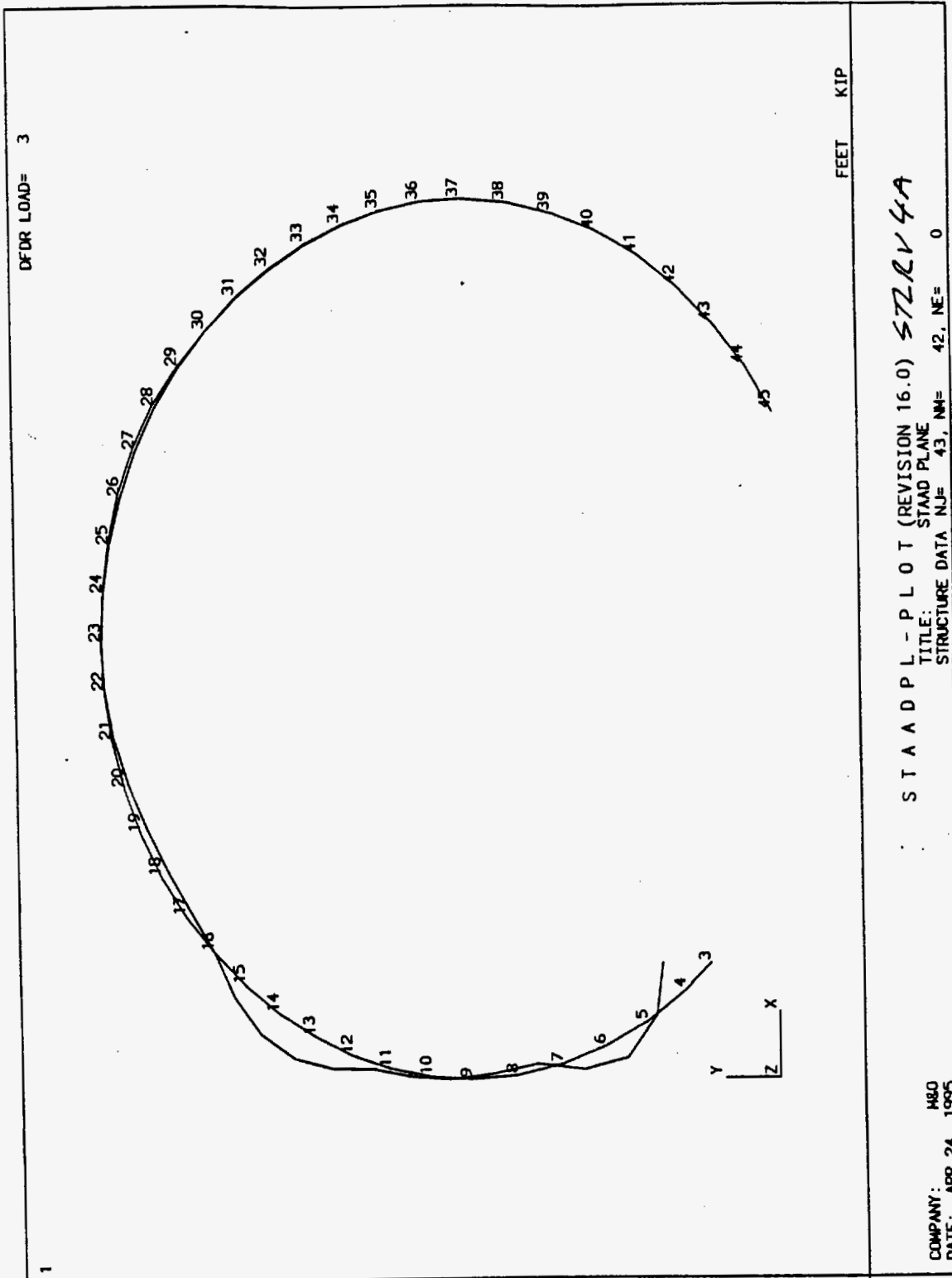
49. PLOT DISPLACEMENT FILE
 50. PLOT BENDING FILE
 51. FINISH

***** END OF STAAD-III *****

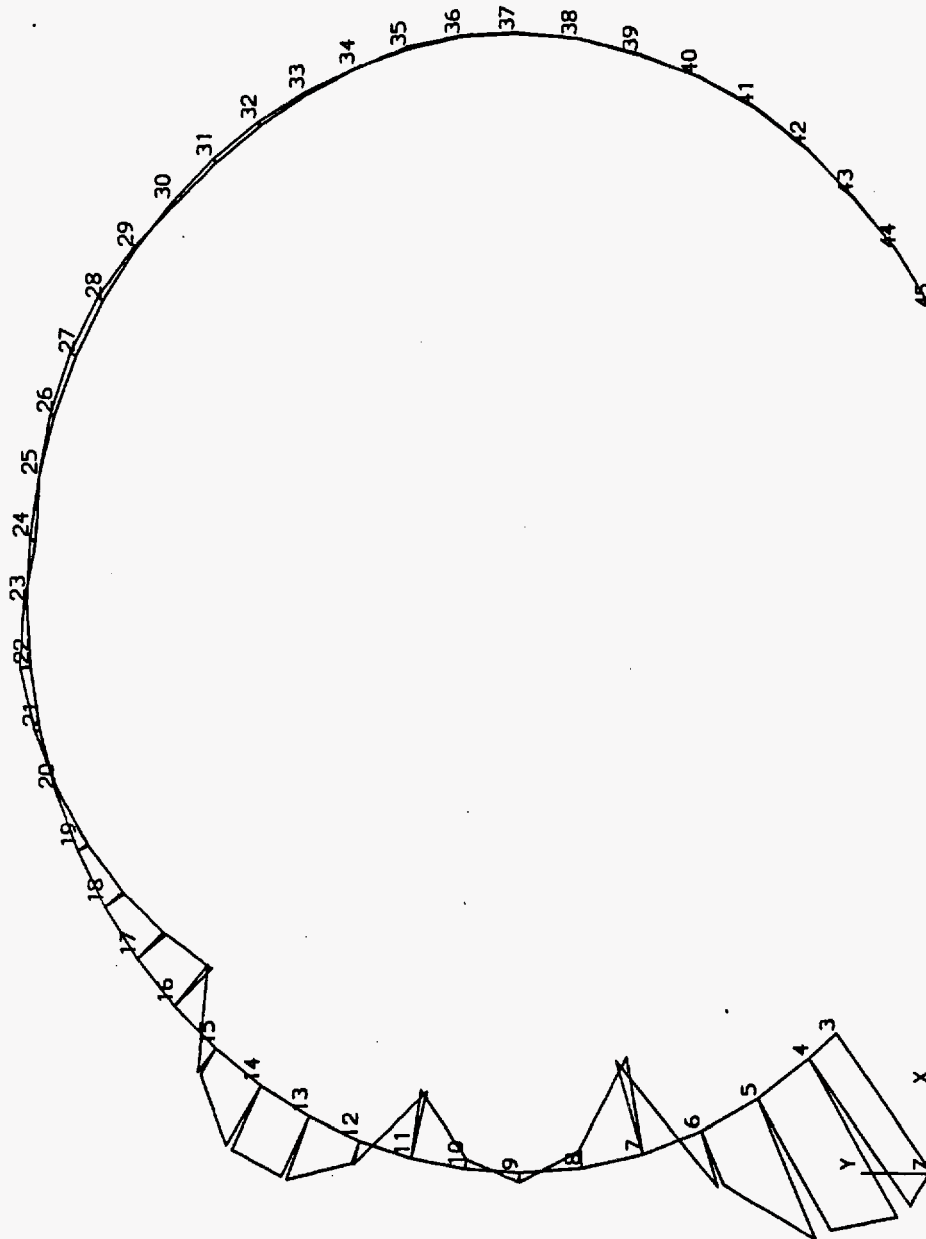
DATE= JUL 18,1995 TIME= 7:58:58 *****







MOMENT MZ LN= 3



FEET KIP

STADPL - PLOT (REVISION 16.0) STZRV 4A
 TITLE: BABEE0000-01717-0200-00003 ATTACHMENT
 STRUCTURE DATA NJ= 43, NM= 42, NE= 0

COMPANY: M&O
 DATE: JUL 18, 1995

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*****
*
*           S T A A D - III
*           Revision 16.0b
*           Proprietary Program of
*           RESEARCH ENGINEERS, Inc.
*           Date=      JUL 18, 1995
*           Time=      8:26:52
*
*****
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1. STAAD PLANE BABEE0000-01717-0200-00003 ATTACHMENT I
2. * ESF GROUND SUPPORT-STRUCTURAL STEEL ANALYSIS REV 00
3. *
4. * FILE STLRV4B
5. * 25 TON JACK APPLIED ONE SIDE @ 51 DEGREES
6. UNIT FT KIP
7. JOINT COORDINATES
8. 3 2.71 2.77 ; 4 2.43 3.13
9. 5 1.58 4.44 ; 6 0.90 5.85 ; 7 0.40 7.33 ; 8 0.10 8.87
10. 9 0.0 10.43 ; 10 0.08 11.79 ; 11 0.31 13.14 ; 12 0.68 14.45
11. 13 1.21 15.71 ; 14 1.86 16.90 ; 15 2.65 18.02 ; 16 3.56 19.03
12. 17 4.58 19.94 ; 18 5.69 20.73 ; 19 6.89 21.39 ; 20 8.15 21.91
13. 21 9.46 22.29 ; 22 10.80 22.52 ; 23 12.17 22.60 ; 24 13.53 22.52
14. 25 14.87 22.29 ; 26 16.18 21.91 ; 27 17.45 21.39 ; 28 18.64 20.73
15. 29 19.75 19.94 ; 30 20.77 19.03 ; 31 21.68 18.02 ; 32 22.47 16.90
16. 33 23.13 15.71 ; 34 23.65 14.45 ; 35 24.03 13.14 ; 36 24.26 11.79
17. 37 24.33 10.43 ; 38 24.23 8.87 ; 39 23.93 7.33 ; 40 23.44 5.85
18. 41 22.76 4.44 ; 42 21.90 3.13 ; 43 20.88 1.94 ; 44 19.72 0.89
19. 45 18.43 0.00
20. MEMBER INCIDENCE
21. 3 3 4 44
22. UNIT KIP INCH
23. MEMBER PROPERTIES
24. 3 TO 44 TA STA W8X31
25. CONSTANTS
26. E 29000.0 ALL
27. DENSITY 0.00028 ALL
28. BETA 0 ALL
29. UNIT FT
30. SUPPORT
31. 3 7 11 35 39 43 FIXED BUT FY MZ
32. 22 24 FIXED BUT FX MZ
33. 16 30 45 PINNED
34. UNIT KIP
35. LOAD 1
36. SELF WEIGHT Y -1.0
37. LOADING 2
38. * 25 TON JACK & ONE SIDED JACKING
39. JOINT LOADING
40. 3 FX -31.47
41. 3 FY 38.86
42. 3 MZ 25.00
43. LOADING COMBINATION 3
44. 1 2.5 2 1.0
```


P R O B L E M S T A T I S T I C S

NUMBER OF JOINTS/MEMBER+ELEMENTS/SUPPORTS = 43/ 42/ 11
ORIGINAL/FINAL BAND-WIDTH = 1/ 1
TOTAL PRIMARY LOAD CASES = 2, TOTAL DEGREES OF FREEDOM = 115
SIZE OF STIFFNESS MATRIX = 690 DOUBLE PREC. WORDS
TOTAL REQUIRED DISK SPACE = 0.08 MEGA-BYTES

++ PROCESSING ELEMENT STIFFNESS MATRIX.	8:26:55
++ PROCESSING GLOBAL STIFFNESS MATRIX.	8:26:55
++ PROCESSING TRIANGULAR FACTORIZATION.	8:26:56
++ CALCULATING JOINT DISPLACEMENTS.	8:26:56
++ CALCULATING MEMBER FORCES.	8:26:56

46. LOAD LIST 3

47. PRINT ANALYSIS RESULTS

JOINT DISPLACEMENT (INCH RADIANS)

STRUCTURE TYPE = PLANE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
3	3	0.00000	0.05839	0.00000	0.00000	0.00000	0.00273
4	3	-0.01030	0.04913	0.00000	0.00000	0.00000	0.00221
5	3	-0.02838	0.03337	0.00000	0.00000	0.00000	0.00051
6	3	-0.02056	0.03345	0.00000	0.00000	0.00000	-0.00061
7	3	0.00000	0.03700	0.00000	0.00000	0.00000	-0.00048
8	3	-0.00043	0.03418	0.00000	0.00000	0.00000	0.00002
9	3	-0.00218	0.03135	0.00000	0.00000	0.00000	0.00001
10	3	-0.00080	0.02892	0.00000	0.00000	0.00000	-0.00001
11	3	0.00000	0.02642	0.00000	0.00000	0.00000	0.00036
12	3	-0.01392	0.02764	0.00000	0.00000	0.00000	0.00058
13	3	-0.02333	0.02870	0.00000	0.00000	0.00000	0.00017
14	3	-0.02285	0.02541	0.00000	0.00000	0.00000	-0.00045
15	3	-0.01295	0.01516	0.00000	0.00000	0.00000	-0.00092
16	3	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00080
17	3	0.00557	-0.00649	0.00000	0.00000	0.00000	-0.00037
18	3	0.00700	-0.00877	0.00000	0.00000	0.00000	-0.00007
19	3	0.00635	-0.00796	0.00000	0.00000	0.00000	0.00010
20	3	0.00509	-0.00536	0.00000	0.00000	0.00000	0.00017
21	3	0.00401	-0.00230	0.00000	0.00000	0.00000	0.00016
22	3	0.00342	0.00000	0.00000	0.00000	0.00000	0.00008
23	3	0.00321	0.00027	0.00000	0.00000	0.00000	0.00002
24	3	0.00301	0.00000	0.00000	0.00000	0.00000	0.00003
25	3	0.00303	0.00129	0.00000	0.00000	0.00000	0.00007
26	3	0.00316	0.00252	0.00000	0.00000	0.00000	0.00005
27	3	0.00314	0.00303	0.00000	0.00000	0.00000	-0.00001
28	3	0.00265	0.00258	0.00000	0.00000	0.00000	-0.00006
29	3	0.00154	0.00140	0.00000	0.00000	0.00000	-0.00010
30	3	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00010
31	3	-0.00096	-0.00092	0.00000	0.00000	0.00000	-0.00006
32	3	-0.00140	-0.00128	0.00000	0.00000	0.00000	-0.00001
33	3	-0.00127	-0.00125	0.00000	0.00000	0.00000	0.00002
34	3	-0.00070	-0.00104	0.00000	0.00000	0.00000	0.00004
35	3	0.00000	-0.00086	0.00000	0.00000	0.00000	0.00003
36	3	0.00023	-0.00082	0.00000	0.00000	0.00000	0.00001
37	3	0.00024	-0.00082	0.00000	0.00000	0.00000	0.00000
38	3	0.00011	-0.00080	0.00000	0.00000	0.00000	-0.00001
39	3	0.00000	-0.00076	0.00000	0.00000	0.00000	0.00000
40	3	0.00027	-0.00082	0.00000	0.00000	0.00000	0.00001
41	3	0.00041	-0.00084	0.00000	0.00000	0.00000	0.00000
42	3	0.00027	-0.00069	0.00000	0.00000	0.00000	-0.00001
43	3	0.00000	-0.00038	0.00000	0.00000	0.00000	-0.00001
44	3	0.00006	-0.00029	0.00000	0.00000	0.00000	-0.00001
45	3	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00001

SUPPORT REACTIONS -UNIT KIP FEET STRUCTURE TYPE = PLANE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
3	3	3.60	0.00	0.00	0.00	0.00	0.00
7	3	27.66	0.00	0.00	0.00	0.00	0.00
11	3	21.39	0.00	0.00	0.00	0.00	0.00
35	3	0.49	0.00	0.00	0.00	0.00	0.00
39	3	-0.42	0.00	0.00	0.00	0.00	0.00
43	3	-0.94	0.00	0.00	0.00	0.00	0.00
22	3	0.00	1.28	0.00	0.00	0.00	0.00
24	3	0.00	-2.15	0.00	0.00	0.00	0.00
16	3	-18.09	-37.04	0.00	0.00	0.00	0.00
30	3	-3.49	2.54	0.00	0.00	0.00	0.00
45	3	1.28	1.04	0.00	0.00	0.00	0.00

MEMBER END FORCES STRUCTURE TYPE = PLANE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
3	3	3	47.79	1.86	0.00	0.00	0.00	-25.00
		4	-47.76	-1.83	0.00	0.00	0.00	25.84
4	3	4	47.74	-2.25	0.00	0.00	0.00	-25.84
		5	-47.64	2.31	0.00	0.00	0.00	22.28
5	3	5	46.97	-8.29	0.00	0.00	0.00	-22.28
		6	-46.86	8.34	0.00	0.00	0.00	9.26
6	3	6	45.48	-14.06	0.00	0.00	0.00	-9.26
		7	-45.36	14.10	0.00	0.00	0.00	-12.73
7	3	7	37.80	7.15	0.00	0.00	0.00	12.73
		8	-37.68	-7.12	0.00	0.00	0.00	-1.54
8	3	8	38.28	2.24	0.00	0.00	0.00	1.54
		9	-38.16	-2.23	0.00	0.00	0.00	1.95
9	3	9	38.15	2.46	0.00	0.00	0.00	1.95
		10	-38.04	-2.45	0.00	0.00	0.00	1.39
10	3	10	37.54	6.61	0.00	0.00	0.00	-1.39
		11	-37.44	-6.60	0.00	0.00	0.00	10.44
11	3	11	42.34	-10.05	0.00	0.00	0.00	-10.44
		12	-42.24	10.08	0.00	0.00	0.00	-3.26
12	3	12	43.16	-4.82	0.00	0.00	0.00	3.26
		13	-43.06	4.86	0.00	0.00	0.00	-9.88
13	3	13	43.33	-0.46	0.00	0.00	0.00	9.88
		14	-43.24	0.51	0.00	0.00	0.00	-10.55
14	3	14	43.02	4.42	0.00	0.00	0.00	10.55
		15	-42.93	-4.36	0.00	0.00	0.00	-4.52
15	3	15	42.11	9.43	0.00	0.00	0.00	4.52
		16	-42.03	-9.36	0.00	0.00	0.00	8.25
16	3	16	2.61	-1.72	0.00	0.00	0.00	-8.25
		17	-2.54	1.80	0.00	0.00	0.00	5.84
17	3	17	2.72	-1.51	0.00	0.00	0.00	-5.84
		18	-2.66	1.60	0.00	0.00	0.00	3.72
18	3	18	2.83	-1.28	0.00	0.00	0.00	-3.72
		19	-2.77	1.37	0.00	0.00	0.00	1.90

MEMBER END FORCES STRUCTURE TYPE = PLANE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
19	3	19	2.91	-1.06	0.00	0.00	0.00	-1.90
		20	-2.87	1.15	0.00	0.00	0.00	0.40
20	3	20	2.98	-0.83	0.00	0.00	0.00	-0.40
		21	-2.95	0.93	0.00	0.00	0.00	-0.81
21	3	21	3.04	-0.60	0.00	0.00	0.00	0.81
		22	-3.02	0.70	0.00	0.00	0.00	-1.69
22	3	22	3.15	0.92	0.00	0.00	0.00	1.69
		23	-3.15	-0.82	0.00	0.00	0.00	-0.50
23	3	23	3.03	1.18	0.00	0.00	0.00	0.50
		24	-3.04	-1.08	0.00	0.00	0.00	1.04
24	3	24	3.26	-0.72	0.00	0.00	0.00	-1.04
		25	-3.28	0.82	0.00	0.00	0.00	-0.01
25	3	25	3.35	-0.45	0.00	0.00	0.00	0.01
		26	-3.38	0.55	0.00	0.00	0.00	-0.69
26	3	26	3.42	-0.19	0.00	0.00	0.00	0.69
		27	-3.46	0.28	0.00	0.00	0.00	-1.01
27	3	27	3.47	0.12	0.00	0.00	0.00	1.01
		28	-3.52	-0.03	0.00	0.00	0.00	-0.90
28	3	28	3.49	0.43	0.00	0.00	0.00	0.90
		29	-3.55	-0.34	0.00	0.00	0.00	-0.38
29	3	29	3.49	0.73	0.00	0.00	0.00	0.38
		30	-3.56	-0.65	0.00	0.00	0.00	0.56
30	3	30	-0.76	0.14	0.00	0.00	0.00	-0.56
		31	0.68	-0.07	0.00	0.00	0.00	0.71
31	3	31	-0.68	-0.01	0.00	0.00	0.00	-0.71
		32	0.60	0.07	0.00	0.00	0.00	0.66
32	3	32	-0.59	-0.13	0.00	0.00	0.00	-0.66
		33	0.49	0.18	0.00	0.00	0.00	0.44
33	3	33	-0.47	-0.24	0.00	0.00	0.00	-0.44
		34	0.37	0.28	0.00	0.00	0.00	0.09
34	3	34	-0.34	-0.32	0.00	0.00	0.00	-0.09
		35	0.24	0.35	0.00	0.00	0.00	-0.37
35	3	35	-0.12	0.11	0.00	0.00	0.00	0.37
		36	0.01	-0.09	0.00	0.00	0.00	-0.23

MEMBER END FORCES STRUCTURE TYPE = PLANE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
36	3	36	-0.02	0.09	0.00	0.00	0.00	0.23
		37	-0.08	-0.08	0.00	0.00	0.00	-0.12
37	3	37	0.07	-0.09	0.00	0.00	0.00	-0.12
		38	-0.19	0.10	0.00	0.00	0.00	-0.03
38	3	38	0.18	-0.12	0.00	0.00	0.00	0.03
		39	-0.29	0.14	0.00	0.00	0.00	-0.24
39	3	39	0.41	0.22	0.00	0.00	0.00	0.24
		40	-0.52	-0.18	0.00	0.00	0.00	0.08
40	3	40	0.54	0.11	0.00	0.00	0.00	-0.08
		41	-0.65	-0.06	0.00	0.00	0.00	0.21
41	3	41	0.65	-0.02	0.00	0.00	0.00	-0.21
		42	-0.75	0.09	0.00	0.00	0.00	0.13
42	3	42	0.73	-0.18	0.00	0.00	0.00	-0.13
		43	-0.82	0.26	0.00	0.00	0.00	-0.22
43	3	43	1.48	0.27	0.00	0.00	0.00	0.22
		44	-1.56	-0.18	0.00	0.00	0.00	0.12
44	3	44	1.57	-0.03	0.00	0.00	0.00	-0.12
		45	-1.64	0.13	0.00	0.00	0.00	0.00

***** END OF LATEST ANALYSIS RESULT *****

48. CHECK CODE ALL

STAAD-III CODE CHECKING - (AISC)

ALL UNITS ARE - KIP FEET (UNLESS OTHERWISE NOTED)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
=====					
3	ST W8X 31	PASS	AISC- H1-2	0.717	3
		47.76 C	0.00	25.84	0.46
4	ST W8X 31	PASS	AISC- H1-2	0.717	3
		47.74 C	0.00	-25.84	0.00
5	ST W8X 31	PASS	AISC- H1-2	0.647	3
		46.97 C	0.00	-22.28	0.00
6	ST W8X 31	PASS	AISC- H1-2	0.464	3
		45.36 C	0.00	-12.73	1.56
7	ST W8X 31	PASS	AISC- H1-2	0.426	3
		37.80 C	0.00	12.73	0.00
8	ST W8X 31	PASS	AISC- H1-2	0.229	3
		38.16 C	0.00	1.95	1.56
9	ST W8X 31	PASS	AISC- H1-2	0.229	3
		38.15 C	0.00	1.95	0.00
10	ST W8X 31	PASS	AISC- H1-2	0.382	3
		37.44 C	0.00	10.44	1.37
11	ST W8X 31	PASS	AISC- H1-2	0.406	3
		42.34 C	0.00	-10.44	0.00
12	ST W8X 31	PASS	AISC- H1-2	0.400	3
		43.06 C	0.00	-9.88	1.37
13	ST W8X 31	PASS	AISC- H1-2	0.413	3
		43.24 C	0.00	-10.55	1.36
14	ST W8X 31	PASS	AISC- H1-2	0.412	3
		43.02 C	0.00	10.55	0.00
15	ST W8X 31	PASS	AISC- H1-2	0.365	3
		42.03 C	0.00	8.25	1.36
16	ST W8X 31	PASS	AISC- H1-3	0.165	3
		2.61 C	0.00	-8.25	0.00
17	ST W8X 31	PASS	AISC- H1-3	0.121	3
		2.72 C	0.00	-5.84	0.00
18	ST W8X 31	PASS	AISC- H1-3	0.083	3
		2.83 C	0.00	-3.72	0.00
19	ST W8X 31	PASS	AISC- H1-3	0.050	3
		2.91 C	0.00	-1.90	0.00
20	ST W8X 31	PASS	AISC- H1-3	0.030	3
		2.95 C	0.00	-0.81	1.36
21	ST W8X 31	PASS	AISC- H1-3	0.047	3
		3.02 C	0.00	-1.69	1.36
22	ST W8X 31	PASS	AISC- H1-3	0.047	3
		3.15 C	0.00	1.69	0.00
23	ST W8X 31	PASS	SHEAR -Y	0.036	3
		3.03 C	0.00	0.50	0.00
24	ST W8X 31	PASS	AISC- H1-3	0.036	3
		3.26 C	0.00	-1.04	0.00
25	ST W8X 31	PASS	AISC- H1-3	0.030	3
		3.38 C	0.00	-0.69	1.36
26	ST W8X 31	PASS	AISC- H1-3	0.036	3
		3.46 C	0.00	-1.01	1.37

L UNITS ARE - KIP FEET (UNLESS OTHERWISE NOTED)

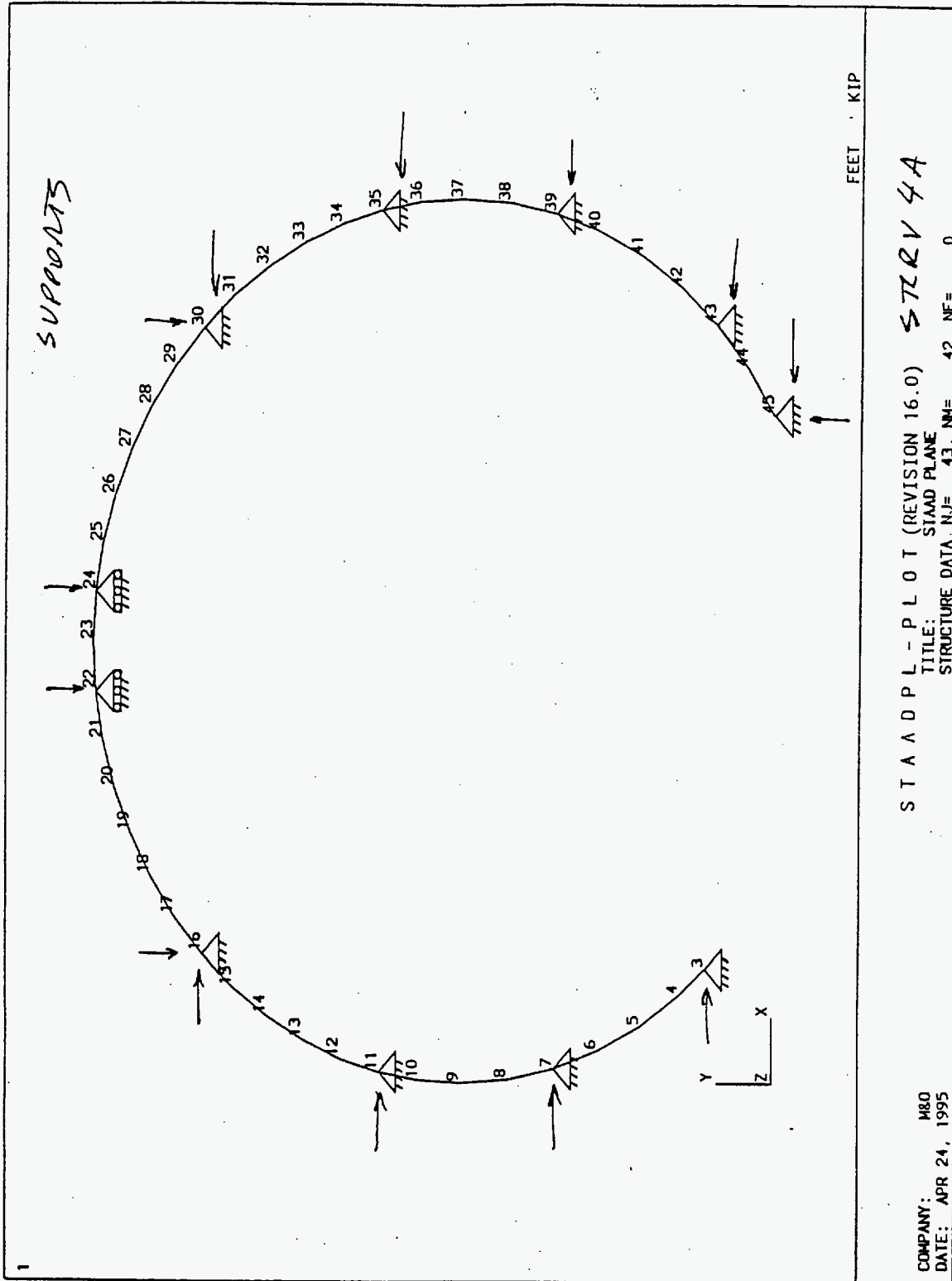
MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
=====					
27	ST W8X 31	PASS	AISC- H1-3	0.036	3
		3.47 C	0.00	1.01	0.00
28	ST W8X 31	PASS	AISC- H1-3	0.035	3
		3.49 C	0.00	0.90	0.00
29	ST W8X 1	PASS	AISC- H1-3	0.029	3
		3.56 C	0.00	0.56	1.37
30	ST W8X 31	PASS	AISC- H2-1	0.016	3
		0.68 T	0.00	0.71	1.36
31	ST W8X 31	PASS	AISC- H2-1	0.017	3
		0.68 T	0.00	-0.71	0.00
32	ST W8X 31	PASS	AISC- H2-1	0.015	3
		0.59 T	0.00	-0.66	0.00
33	ST W8X 31	PASS	AISC- H2-1	0.010	3
		0.47 T	0.00	-0.44	0.00
34	ST W8X 31	PASS	SHEAR -Y	0.011	3
		0.24 T	0.00	-0.37	1.36
35	ST W8X 31	PASS	AISC- H2-1	0.007	3
		0.12 T	0.00	0.37	0.00
36	ST W8X 31	PASS	AISC- H2-1	0.004	3
		0.02 T	0.00	0.23	0.00
37	ST W8X 31	PASS	SHEAR -Y	0.003	3
		0.19 C	0.00	-0.03	1.56
38	ST W8X 31	PASS	AISC- H1-3	0.006	3
		0.29 C	0.00	-0.24	1.57
39	ST W8X 31	PASS	SHEAR -Y	0.007	3
		0.41 C	0.00	0.24	0.00
40	ST W8X 31	PASS	AISC- H1-3	0.007	3
		0.65 C	0.00	0.21	1.57
41	ST W8X 31	PASS	AISC- H1-3	0.007	3
		0.65 C	0.00	-0.21	0.00
42	ST W8X 31	PASS	AISC- H1-3	0.008	3
		0.82 C	0.00	-0.22	1.57
43	ST W8X 31	PASS	AISC- H1-3	0.012	3
		1.48 C	0.00	0.22	0.00
44	ST W8X 31	PASS	AISC- H1-3	0.010	3
		1.57 C	0.00	-0.12	0.00

***** END OF TABULATED RESULT OF DESIGN *****

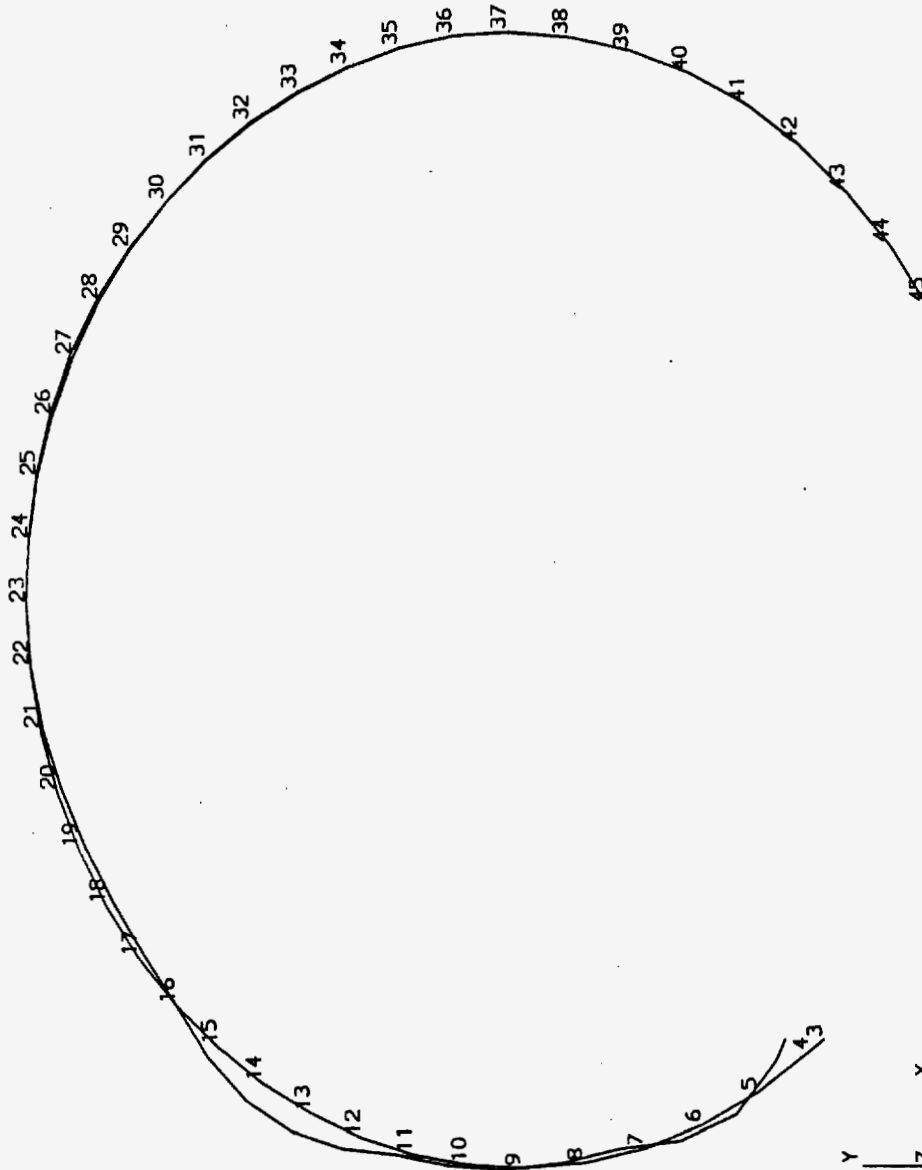
49. PLOT DISPLACEMENT FILE
 50. PLOT BENDING FILE
 51. FINISH

***** END OF STAAD-III *****

DATE= JUL 18,1995 TIME= 8:27: 0 *****



DFDR LOAD= 3

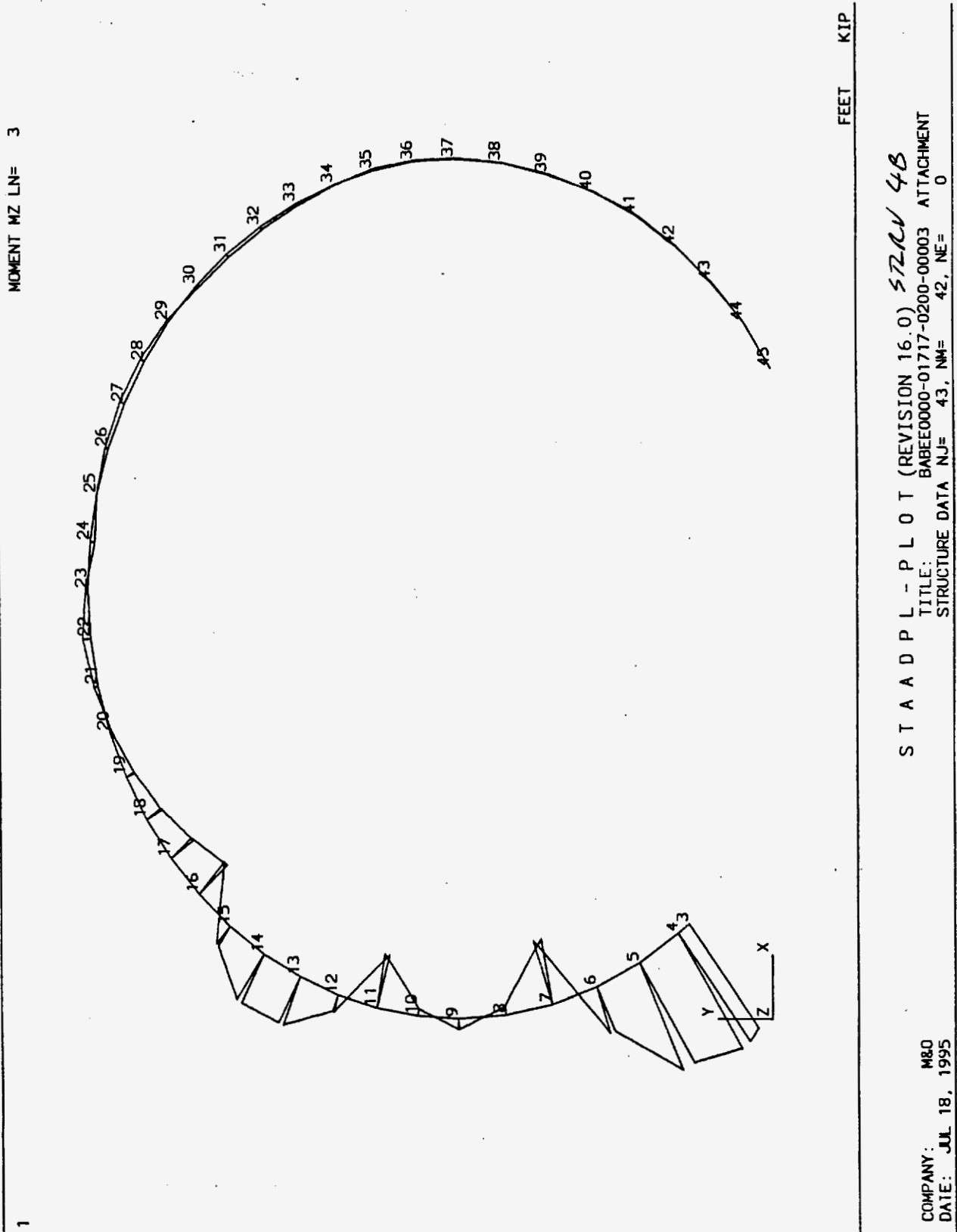


FEET KIP

STAD P L - P L O T (REVISION 16.0) *STAD 45*

TITLE: BABEE0000-01717-0200-00003 ATTACHMENT
STRUCTURE DATA NJ= 43, NM= 42, NE= 0

COMPANY: M80
DATE: JUL 18, 1995



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*****
*
*          S T A A D - III
*      Revision 16.0b
*      Proprietary Program of
*      RESEARCH ENGINEERS, Inc.
*      Date=      JUL 18, 1995
*      Time=      11:28:30
*
*****

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1. STAAD PLANE BABEE0000-01717-0200-00003 ATTACHMENT I
2. * ESF GROUND SUPPORT-STRUCTURAL STEEL ANALYSIS REV 00
3. *
4. * FILE STLRV4C
5. * 25 TON JACK APPLIED ONE SIDE @ 47 DEGREES
6. * MOMENT MZ RELEASED AT THE END OF MEMBERS 15 & 29
7. * MOMENT MZ RELEASED AT THE START OF MEMBERS 16 & 30
8. UNIT FT KIP
9. JOINT COORDINATES
10. 3 3.27 2.13 ; 4 2.43 3.13
11. 5 1.58 4.44 ; 6 0.90 5.85 ; 7 0.40 7.33 ; 8 0.10 8.87
12. 9 0.0 10.43 ; 10 0.08 11.79 ; 11 0.31 13.14 ; 12 0.68 14.45
13. 13 1.21 15.71 ; 14 1.86 16.90 ; 15 2.65 18.02 ; 16 3.56 19.03
14. 17 4.58 19.94 ; 18 5.69 20.73 ; 19 6.89 21.39 ; 20 8.15 21.91
15. 21 9.46 22.29 ; 22 10.80 22.52 ; 23 12.17 22.60 ; 24 13.53 22.52
16. 25 14.87 22.29 ; 26 16.18 21.91 ; 27 17.45 21.39 ; 28 18.64 20.73
17. 29 19.75 19.94 ; 30 20.77 19.03 ; 31 21.68 18.02 ; 32 22.47 16.90
18. 33 23.13 15.71 ; 34 23.65 14.45 ; 35 24.03 13.14 ; 36 24.26 11.79
19. 37 24.33 10.43 ; 38 24.23 8.87 ; 39 23.93 7.33 ; 40 23.44 5.85
20. 41 22.76 4.44 ; 42 21.90 3.13 ; 43 20.88 1.94 ; 44 19.72 0.89
21. 45 18.43 0.00
22. MEMBER INCIDENCE
23. 3 3 4 44
24. UNIT KIP INCH
25. MEMBER RELEASE
26. 15 29 END MZ
27. 16 30 START MZ
28. MEMBER PROPERTIES
29. 3 TO 44 TA STA W8X31
30. CONSTANTS
31. E 29000.0 ALL
32. DENSITY 0.00028 ALL
33. BETA 0 ALL
34. UNIT FT
35. SUPPORT
36. 3 7 11 35 39 43 FIXED BUT FY MZ
37. 22 24 FIXED BUT FX MZ
38. 16 30 45 PINNED
39. UNIT KIP
40. LOAD 1
41. SELF WEIGHT Y -1.0
42. LOADING 2
43. * 25 TON JACK & ONE SIDED JACKING
44. JOINT LOADING
45. 3 FX -34.1
46. 3 FY 36.57
47. 3 MZ 25.00

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- 48. LOADING COMBINATION 3
- 49. 1 2.5 2 1.0
- 50. PERFORM ANALYSIS

P R O B L E M S T A T I S T I C S

NUMBER OF JOINTS/MEMBER+ELEMENTS/SUPPORTS = 43/ 42/ 11
ORIGINAL/FINAL BAND-WIDTH = 1/ 1
TOTAL PRIMARY LOAD CASES = 2, TOTAL DEGREES OF FREEDOM = 115
SIZE OF STIFFNESS MATRIX = 690 DOUBLE PREC. WORDS
TOTAL REQUIRED DISK SPACE = 0.08 MEGA-BYTES

++ PROCESSING ELEMENT STIFFNESS MATRIX.	11:28:33
++ PROCESSING GLOBAL STIFFNESS MATRIX.	11:28:34
++ PROCESSING TRIANGULAR FACTORIZATION.	11:28:34
++ CALCULATING JOINT DISPLACEMENTS.	11:28:35
++ CALCULATING MEMBER FORCES.	11:28:35

- 51. LOAD LIST 3
- 52. PRINT ANALYSIS RESULTS

JOINT DISPLACEMENT (INCH RADIANS)

STRUCTURE TYPE = PLANE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
3	3	0.00000	0.06910	0.00000	0.00000	0.00000	0.00342
4	3	-0.03097	0.03955	0.00000	0.00000	0.00000	0.00186
5	3	-0.04236	0.02831	0.00000	0.00000	0.00000	0.00008
6	3	-0.02702	0.03218	0.00000	0.00000	0.00000	-0.00100
7	3	0.00000	0.03808	0.00000	0.00000	0.00000	-0.00077
8	3	0.00352	0.03621	0.00000	0.00000	0.00000	-0.00011
9	3	0.00263	0.03360	0.00000	0.00000	0.00000	0.00003
10	3	0.00239	0.03141	0.00000	0.00000	0.00000	0.00013
11	3	0.00000	0.02960	0.00000	0.00000	0.00000	0.00056
12	3	-0.01765	0.03201	0.00000	0.00000	0.00000	0.00079
13	3	-0.03021	0.03454	0.00000	0.00000	0.00000	0.00030
14	3	-0.03095	0.03205	0.00000	0.00000	0.00000	-0.00050
15	3	-0.01909	0.02056	0.00000	0.00000	0.00000	-0.00127
16	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
17	3	0.00016	-0.00024	0.00000	0.00000	0.00000	-0.00001
18	3	0.00024	-0.00042	0.00000	0.00000	0.00000	-0.00001
19	3	0.00025	-0.00050	0.00000	0.00000	0.00000	0.00000
20	3	0.00019	-0.00043	0.00000	0.00000	0.00000	0.00001
21	3	0.00010	-0.00023	0.00000	0.00000	0.00000	0.00001
22	3	0.00003	0.00000	0.00000	0.00000	0.00000	0.00001
23	3	0.00000	0.00005	0.00000	0.00000	0.00000	0.00000
24	3	-0.00003	0.00000	0.00000	0.00000	0.00000	-0.00001
25	3	-0.00010	-0.00023	0.00000	0.00000	0.00000	-0.00001
26	3	-0.00019	-0.00043	0.00000	0.00000	0.00000	-0.00001
27	3	-0.00025	-0.00050	0.00000	0.00000	0.00000	0.00000
28	3	-0.00024	-0.00042	0.00000	0.00000	0.00000	0.00001
29	3	-0.00016	-0.00024	0.00000	0.00000	0.00000	0.00001
30	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
31	3	-0.00055	-0.00056	0.00000	0.00000	0.00000	-0.00003
32	3	-0.00087	-0.00085	0.00000	0.00000	0.00000	-0.00001
33	3	-0.00084	-0.00087	0.00000	0.00000	0.00000	0.00001
34	3	-0.00048	-0.00076	0.00000	0.00000	0.00000	0.00002
35	3	0.00000	-0.00065	0.00000	0.00000	0.00000	0.00002
36	3	0.00012	-0.00064	0.00000	0.00000	0.00000	0.00000
37	3	0.00010	-0.00065	0.00000	0.00000	0.00000	0.00000
38	3	0.00002	-0.00065	0.00000	0.00000	0.00000	0.00000
39	3	0.00000	-0.00063	0.00000	0.00000	0.00000	0.00001
40	3	0.00025	-0.00069	0.00000	0.00000	0.00000	0.00001
41	3	0.00037	-0.00072	0.00000	0.00000	0.00000	0.00000
42	3	0.00024	-0.00059	0.00000	0.00000	0.00000	-0.00001
43	3	0.00000	-0.00033	0.00000	0.00000	0.00000	-0.00001
44	3	0.00006	-0.00025	0.00000	0.00000	0.00000	-0.00001
45	3	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00001

ATTACHMENT I

DI: BABEE0000-01717-0200-00003 REV 02

Title: ESF Ground Support - Structural Steel Analysis

Page: I - 162 of I-174

SUPPORT REACTIONS -UNIT KIP FEET STRUCTURE TYPE = PLANE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
3	3	6.37	0.00	0.00	0.00	0.00	0.00
7	3	27.80	0.00	0.00	0.00	0.00	0.00
11	3	21.31	0.00	0.00	0.00	0.00	0.00
35	3	0.43	0.00	0.00	0.00	0.00	0.00
39	3	-0.31	0.00	0.00	0.00	0.00	0.00
43	3	-0.84	0.00	0.00	0.00	0.00	0.00
22	3	0.00	0.20	0.00	0.00	0.00	0.00
24	3	0.00	0.20	0.00	0.00	0.00	0.00
16	3	-20.92	-34.61	0.00	0.00	0.00	0.00
30	3	-0.83	1.33	0.00	0.00	0.00	0.00
45	3	1.08	0.89	0.00	0.00	0.00	0.00

MEMBER END FORCES STRUCTURE TYPE = PLANE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
3	3	3	45.84	2.29	0.00	0.00	0.00	-25.00
		4	-45.76	-2.22	0.00	0.00	0.00	27.95
4	3	4	45.69	-3.41	0.00	0.00	0.00	-27.95
		5	-45.59	3.48	0.00	0.00	0.00	22.57
5	3	5	44.79	-9.19	0.00	0.00	0.00	-22.57
		6	-44.68	9.24	0.00	0.00	0.00	8.15
6	3	6	43.20	-14.67	0.00	0.00	0.00	-8.15
		7	-43.09	14.71	0.00	0.00	0.00	-14.80
7	3	7	35.43	6.98	0.00	0.00	0.00	14.80
		8	-35.31	-6.95	0.00	0.00	0.00	-3.88
8	3	8	35.91	2.37	0.00	0.00	0.00	3.88
		9	-35.79	-2.37	0.00	0.00	0.00	-0.17
9	3	9	35.81	2.03	0.00	0.00	0.00	-0.17
		10	-35.71	-2.03	0.00	0.00	0.00	2.94
10	3	10	35.27	5.94	0.00	0.00	0.00	-2.94
		11	-35.17	-5.92	0.00	0.00	0.00	11.05
11	3	11	40.13	-10.89	0.00	0.00	0.00	-11.05
		12	-40.03	10.92	0.00	0.00	0.00	-3.79
12	3	12	41.07	-5.93	0.00	0.00	0.00	3.79
		13	-40.97	5.97	0.00	0.00	0.00	-11.92
13	3	13	41.36	-1.77	0.00	0.00	0.00	11.92
		14	-41.27	1.82	0.00	0.00	0.00	-14.35
14	3	14	41.21	2.90	0.00	0.00	0.00	14.35
		15	-41.13	-2.84	0.00	0.00	0.00	-10.42
15	3	15	40.50	7.70	0.00	0.00	0.00	10.42
		16	-40.42	-7.63	0.00	0.00	0.00	0.00
16	3	16	0.70	0.09	0.00	0.00	0.00	0.00
		17	-0.63	-0.01	0.00	0.00	0.00	0.07
17	3	17	0.62	0.03	0.00	0.00	0.00	-0.07
		18	-0.56	0.01	0.00	0.00	0.00	0.12
18	3	18	0.56	0.06	0.00	0.00	0.00	-0.12
		19	-0.51	0.03	0.00	0.00	0.00	0.13

MEMBER END FORCES STRUCTURE TYPE = PLANE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
19	3	19	0.51	0.02	0.00	0.00	0.00	-0.13
		20	-0.47	0.07	0.00	0.00	0.00	0.10
20	3	20	0.48	-0.02	0.00	0.00	0.00	-0.10
		21	-0.45	0.12	0.00	0.00	0.00	0.00
21	3	21	0.46	-0.07	0.00	0.00	0.00	0.00
		22	-0.44	0.17	0.00	0.00	0.00	-0.16
22	3	22	0.47	0.08	0.00	0.00	0.00	0.16
		23	-0.46	0.03	0.00	0.00	0.00	-0.13
23	3	23	0.46	0.03	0.00	0.00	0.00	0.13
		24	-0.47	0.08	0.00	0.00	0.00	-0.16
24	3	24	0.44	0.17	0.00	0.00	0.00	0.16
		25	-0.46	-0.07	0.00	0.00	0.00	0.00
25	3	25	0.45	0.12	0.00	0.00	0.00	0.00
		26	-0.48	-0.02	0.00	0.00	0.00	0.10
26	3	26	0.47	0.07	0.00	0.00	0.00	-0.10
		27	-0.51	0.03	0.00	0.00	0.00	0.13
27	3	27	0.51	0.03	0.00	0.00	0.00	-0.13
		28	-0.56	0.06	0.00	0.00	0.00	0.12
28	3	28	0.56	0.01	0.00	0.00	0.00	-0.12
		29	-0.62	0.08	0.00	0.00	0.00	0.07
29	3	29	0.63	-0.01	0.00	0.00	0.00	-0.07
		30	-0.70	0.09	0.00	0.00	0.00	0.00
30	3	30	-0.84	0.26	0.00	0.00	0.00	0.00
		31	0.76	-0.19	0.00	0.00	0.00	0.31
31	3	31	-0.78	0.10	0.00	0.00	0.00	-0.31
		32	0.69	-0.04	0.00	0.00	0.00	0.40
32	3	32	-0.69	-0.04	0.00	0.00	0.00	-0.40
		33	0.60	0.09	0.00	0.00	0.00	0.32
33	3	33	-0.59	-0.16	0.00	0.00	0.00	-0.32
		34	0.49	0.20	0.00	0.00	0.00	0.08
34	3	34	-0.47	-0.25	0.00	0.00	0.00	-0.08
		35	0.37	0.28	0.00	0.00	0.00	-0.28
35	3	35	-0.26	0.11	0.00	0.00	0.00	0.28
		36	0.16	-0.09	0.00	0.00	0.00	-0.14

MEMBER END FORCES STRUCTURE TYPE = PLANE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
36	3	36	-0.17	0.07	0.00	0.00	0.00	0.14
		37	0.06	-0.06	0.00	0.00	0.00	-0.05
37	3	37	-0.07	-0.06	0.00	0.00	0.00	-0.05
		38	-0.05	0.06	0.00	0.00	0.00	-0.04
38	3	38	0.04	-0.07	0.00	0.00	0.00	0.04
		39	-0.16	0.09	0.00	0.00	0.00	-0.17
39	3	39	0.24	0.18	0.00	0.00	0.00	0.17
		40	-0.36	-0.14	0.00	0.00	0.00	0.08
40	3	40	0.37	0.10	0.00	0.00	0.00	-0.08
		41	-0.48	-0.04	0.00	0.00	0.00	0.19
41	3	41	0.48	-0.02	0.00	0.00	0.00	-0.19
		42	-0.58	0.09	0.00	0.00	0.00	0.11
42	3	42	0.57	-0.16	0.00	0.00	0.00	-0.11
		43	-0.66	0.24	0.00	0.00	0.00	-0.20
43	3	43	1.24	0.24	0.00	0.00	0.00	0.20
		44	-1.32	-0.15	0.00	0.00	0.00	0.11
44	3	44	1.33	-0.02	0.00	0.00	0.00	-0.11
		45	-1.40	0.12	0.00	0.00	0.00	0.00

***** END OF LATEST ANALYSIS RESULT *****

53. CHECK CODE ALL

STAAD-III CODE CHECKING - (AISC)

ALL UNITS ARE - KIP FEET (UNLESS OTHERWISE NOTED)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
3	ST W8X 31	PASS 45.76 C	AISC- H1-2 0.00	0.745 27.95	3 1.31
4	ST W8X 31	PASS 45.69 C	AISC- H1-2 0.00	0.745 -27.95	3 0.00
5	ST W8X 31	PASS 44.79 C	AISC- H1-2 0.00	0.642 -22.57	3 0.00
6	ST W8X 31	PASS 43.09 C	AISC- H1-2 0.00	0.490 -14.80	3 1.56
7	ST W8X 31	PASS 35.43 C	AISC- H1-2 0.00	0.452 14.80	3 0.00
8	ST W8X 31	PASS 35.91 C	AISC- H1-2 0.00	0.253 3.88	3 0.00
9	ST W8X 31	PASS 35.71 C	AISC- H1-2 0.00	0.235 2.94	3 1.36
10	ST W8X 31	PASS 35.17 C	AISC- H1-2 0.00	0.381 11.05	3 1.37
11	ST W8X 31	PASS 40.13 C	AISC- H1-2 0.00	0.407 -11.05	3 0.00
12	ST W8X 31	PASS 40.97 C	AISC- H1-2 0.00	0.427 -11.92	3 1.37
13	ST W8X 31	PASS 41.27 C	AISC- H1-2 0.00	0.473 -14.35	3 1.36
14	ST W8X 31	PASS 41.21 C	AISC- H1-2 0.00	0.473 14.35	3 0.00
15	ST W8X 31	PASS 40.50 C	AISC- H1-2 0.00	0.397 10.42	3 0.00
16	ST W8X 31	PASS 0.63 C	AISC- H1-3 0.00	0.004 0.07	3 1.37
17	ST W8X 31	PASS 0.56 C	AISC- H1-3 0.00	0.005 0.12	3 1.36
18	ST W8X 31	PASS 0.56 C	AISC- H1-3 0.00	0.005 -0.12	3 0.00
19	ST W8X 31	PASS 0.51 C	AISC- H1-3 0.00	0.005 -0.13	3 0.00
20	ST W8X 31	PASS 0.48 C	AISC- H1-3 0.00	0.004 -0.10	3 0.00
21	ST W8X 31	PASS 0.44 C	AISC- H1-3 0.00	0.005 -0.16	3 1.36
22	ST W8X 31	PASS 0.47 C	AISC- H1-3 0.00	0.005 0.16	3 0.00
23	ST W8X 31	PASS 0.47 C	AISC- H1-3 0.00	0.005 -0.16	3 1.36
24	ST W8X 31	PASS 0.44 C	AISC- H1-3 0.00	0.005 0.16	3 0.00
25	ST W8X 31	PASS 0.48 C	AISC- H1-3 0.00	0.004 0.10	3 1.36
26	ST W8X 31	PASS 0.51 C	AISC- H1-3 0.00	0.005 0.13	3 1.37

L UNITS ARE - KIP FEET (UNLESS OTHERWISE NOTED)

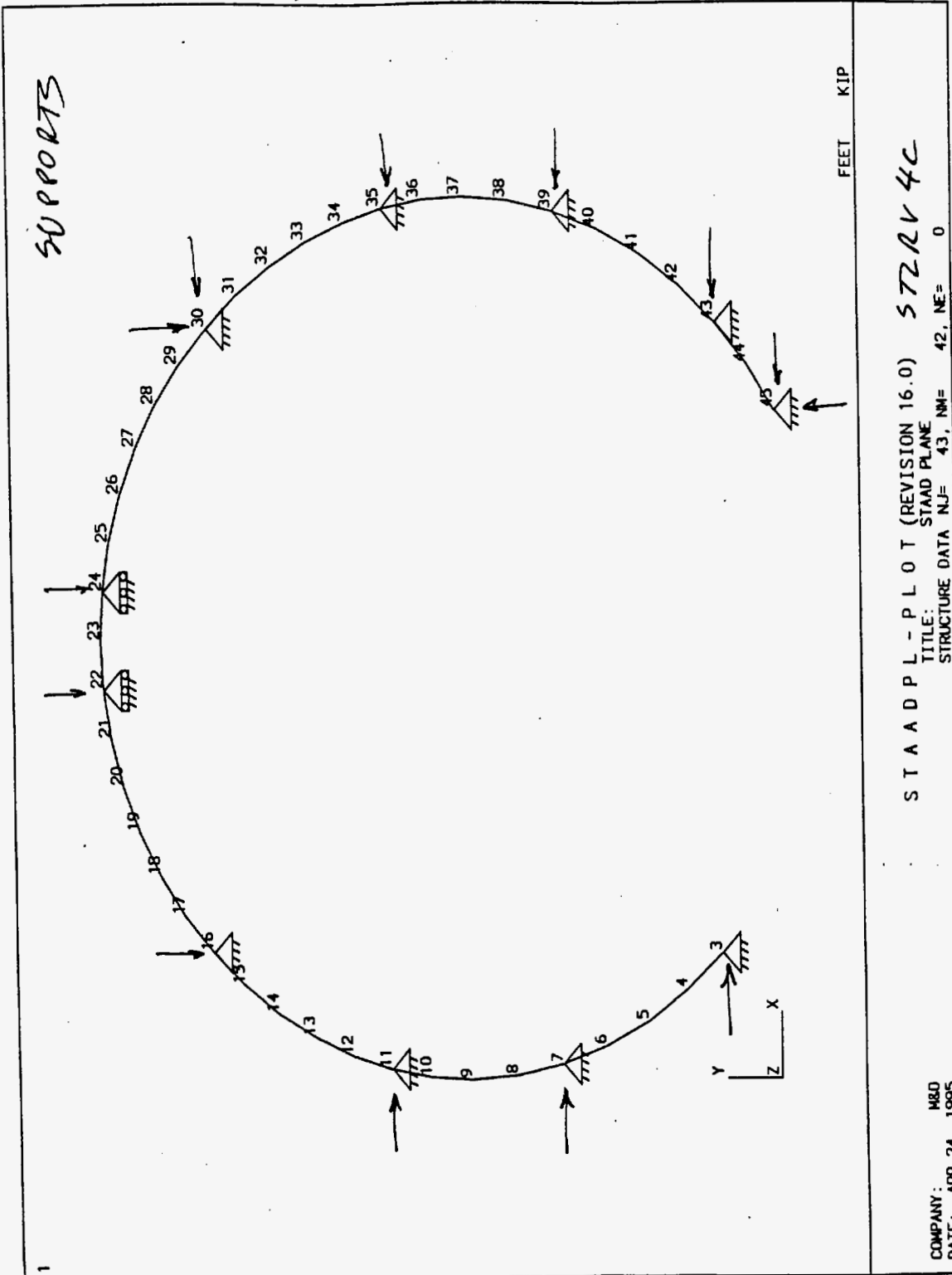
MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
=====					
27	ST W8X 31	PASS	AISC- H1-3	0.005	3
		0.51 C	0.00	-0.13	0.00
28	ST W8X 31	PASS	AISC- H1-3	0.005	3
		0.56 C	0.00	-0.12	0.00
29	ST W8X 31	PASS	AISC- H1-3	0.004	3
		0.63 C	0.00	-0.07	0.00
30	ST W8X 31	PASS	AISC- H2-1	0.010	3
		0.76 T	0.00	0.31	1.36
31	ST W8X 31	PASS	AISC- H2-1	0.011	3
		0.69 T	0.00	0.40	1.37
32	ST W8X 31	PASS	AISC- H2-1	0.011	3
		0.69 T	0.00	-0.40	0.00
33	ST W8X 31	PASS	AISC- H2-1	0.009	3
		0.59 T	0.00	-0.32	0.00
34	ST W8X 31	PASS	SHEAR -Y	0.008	3
		0.37 T	0.00	-0.28	1.36
35	ST W8X 31	PASS	AISC- H2-1	0.006	3
		0.26 T	0.00	0.28	0.00
36	ST W8X 31	PASS	AISC- H2-1	0.003	3
		0.17 T	0.00	0.14	0.00
37	ST W8X 31	PASS	SHEAR -Y	0.002	3
		0.05 C	0.00	-0.04	1.56
38	ST W8X 31	PASS	AISC- H1-3	0.004	3
		0.16 C	0.00	-0.17	1.57
39	ST W8X 31	PASS	SHEAR -Y	0.006	3
		0.24 C	0.00	0.17	0.00
40	ST W8X 31	PASS	AISC- H1-3	0.006	3
		0.48 C	0.00	0.19	1.57
41	ST W8X 31	PASS	AISC- H1-3	0.006	3
		0.48 C	0.00	-0.19	0.00
42	ST W8X 31	PASS	SHEAR -Y	0.007	3
		0.66 C	0.00	-0.20	1.57
43	ST W8X 31	PASS	AISC- H1-3	0.010	3
		1.24 C	0.00	0.20	0.00
44	ST W8X 31	PASS	AISC- H1-3	0.009	3
		1.33 C	0.00	-0.11	0.00

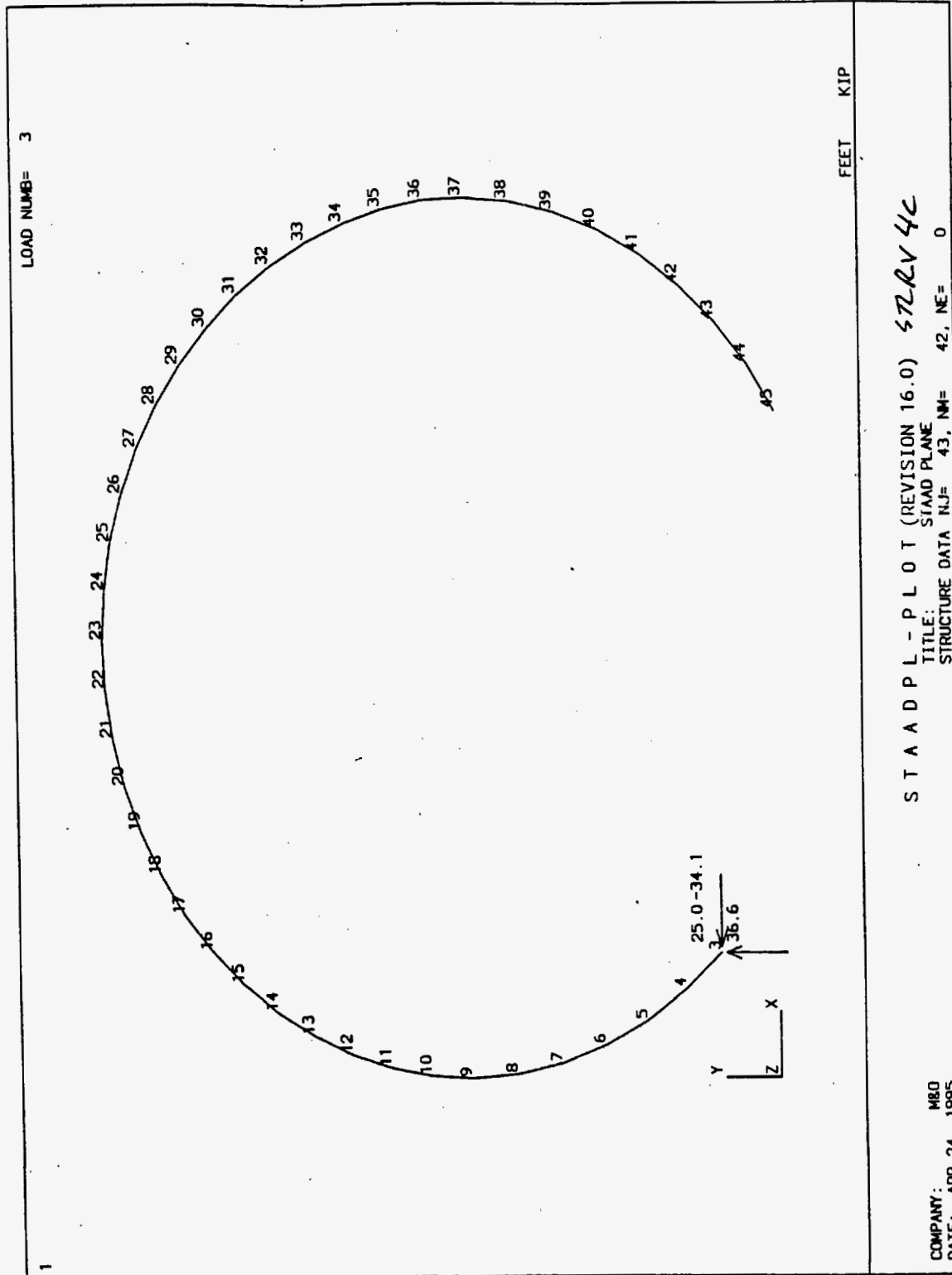
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54. PLOT DISPLACEMENT FILE
 55. PLOT BENDING FILE
 56. FINISH

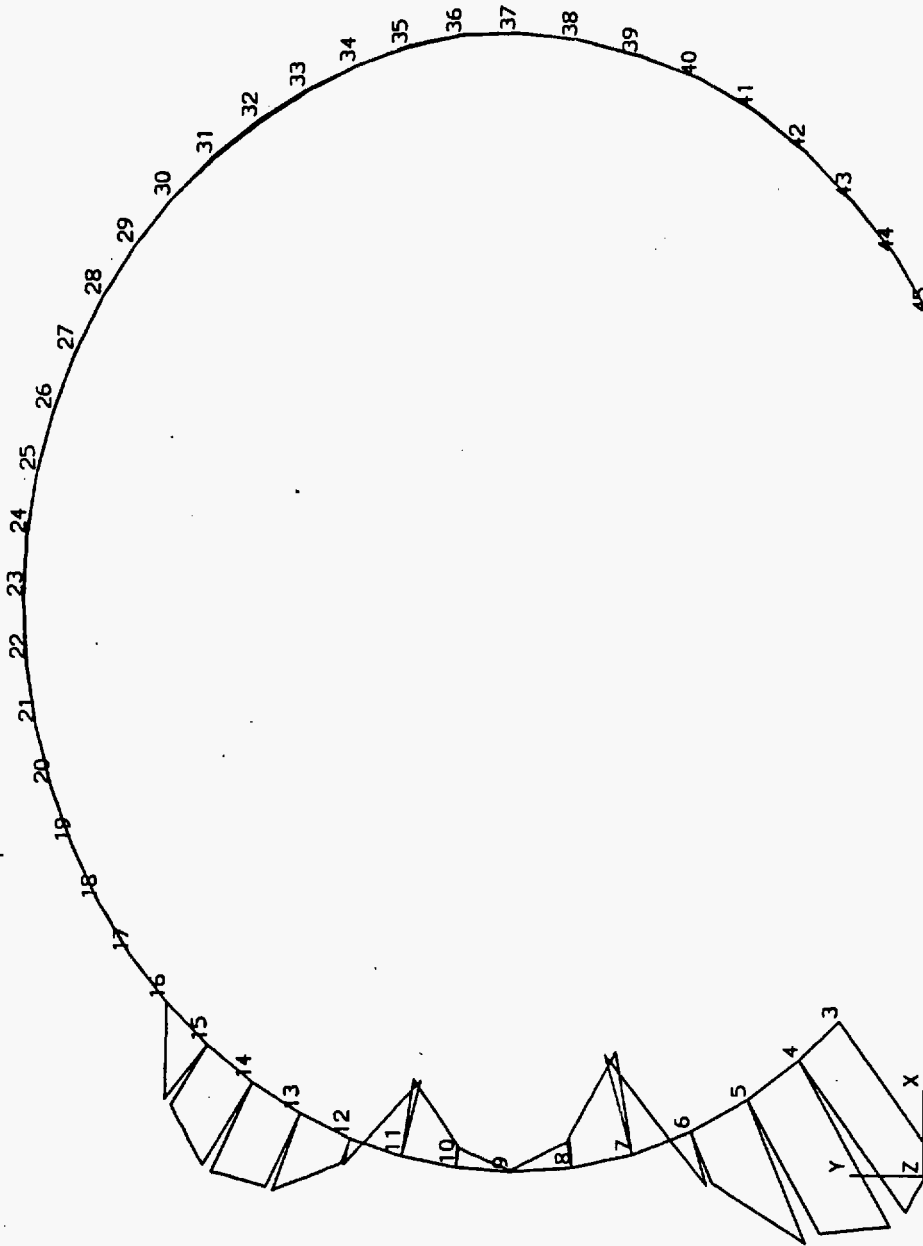
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DATE= JUL 18,1995 TIME= 11:28:39 *****





MOMENT MZ LN= 3



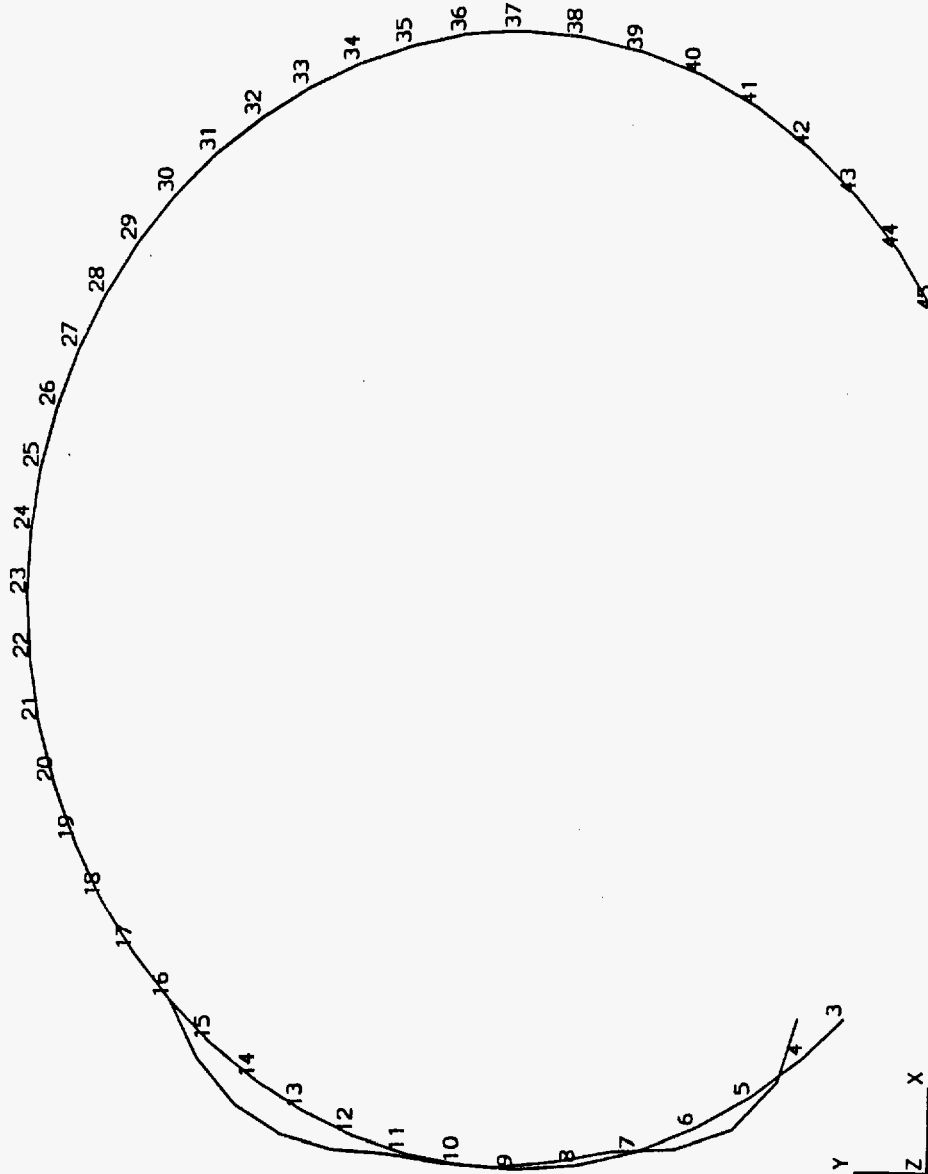
FEET KIP

STAAD PL - PLOT (REVISION 16.0) STZ RV 4C

TITLE: BABEE0000-01717-0200-00003 ATTACHMENT
STRUCTURE DATA NJ= 43, NM= 42, NE= 0

COMPANY: M&O
DATE: JUL 18, 1995

DFDR LOAD= 3



FEET KIP

STADPL - PLOT (REVISION 16.0) SZ RV 4C
 TITLE: BABEE0000-01717-0200-00003 ATTACHMENT
 STRUCTURE DATA NJ= 43, NW= 42, NE= 0

COMPANY: M80
 DATE: JUL 18, 1995

SUMMARY OF COMPUTER ANALYSES FOR JACKING LOADS

Analysis No.	LOAD	SCOPE	Supports	Interaction coefficient	Member	Comparison Conclusion
1. STLRV2	50T @ 47 30T @ 47 25T @ 47 Both sides	Determine jack capacity to be used	@ every 4th node	50T: 1.488 30T: 0.893 25T: 0.744	3 3 3, 4, 42	Steel set not adequate Too close Steel set adequate
2. STLRV3A	25T @ 49 Both sides	)Check W8X31 size of steel set	@ every 4th node	0.730	3	Size of steel set W8X31 is adequate
3. STLRV3D	25T @ 51 Both sides	)Compare results of varying the angle of application of the jack	@ every 4th node	0.717	3,4,41,42	47 degree governs by a very small margin.
4. STLRV3B	25T @ 47 Both sides	) Same as above with moment released	@ every 4th node	0.745	3,4,41,42	Moment release at splice can be accommodated by the steel set W8X31
5. STLRV3C	25T @ 49 Both sides	)at splice	@ every 4th node	0.731	3	
6. STLRV3A1	25T @ 47 Both sides	) Check stresses for partial and full	@ most nodes	0.729	3, 42	Full rock engagement governs
7. STLRV3A2	25 T @ 47 Both sides	)rock engagement	@ all nodes	0.767	3, 42	Size of W8X31 steel set is adequate
8. STLRV4	25T @ 47 on one side	)Evaluate stresses in the steel set due to one side jacking	@ every 4th node	0.744	3, 4	Jacking from one side only, can be accommodated by the steel sets.
9. STLRV4A	25T @ 49 on one side	)for the applicable angles of application of the jacking load	@ every 4th node	0.730	3,4	47 deg. governs by a small margin.

10. STLRV4B	25T @ 51) See above on on one side)previous page	@ every 4th node	0.717	3, 4	
11. STLRV4C	25T @ 47)Check stresses in the on one side)steel set with the)moment released)at splice.	@ every 4th node	0.745	3, 4	Moment release at splice can be accommodated by the steel sets

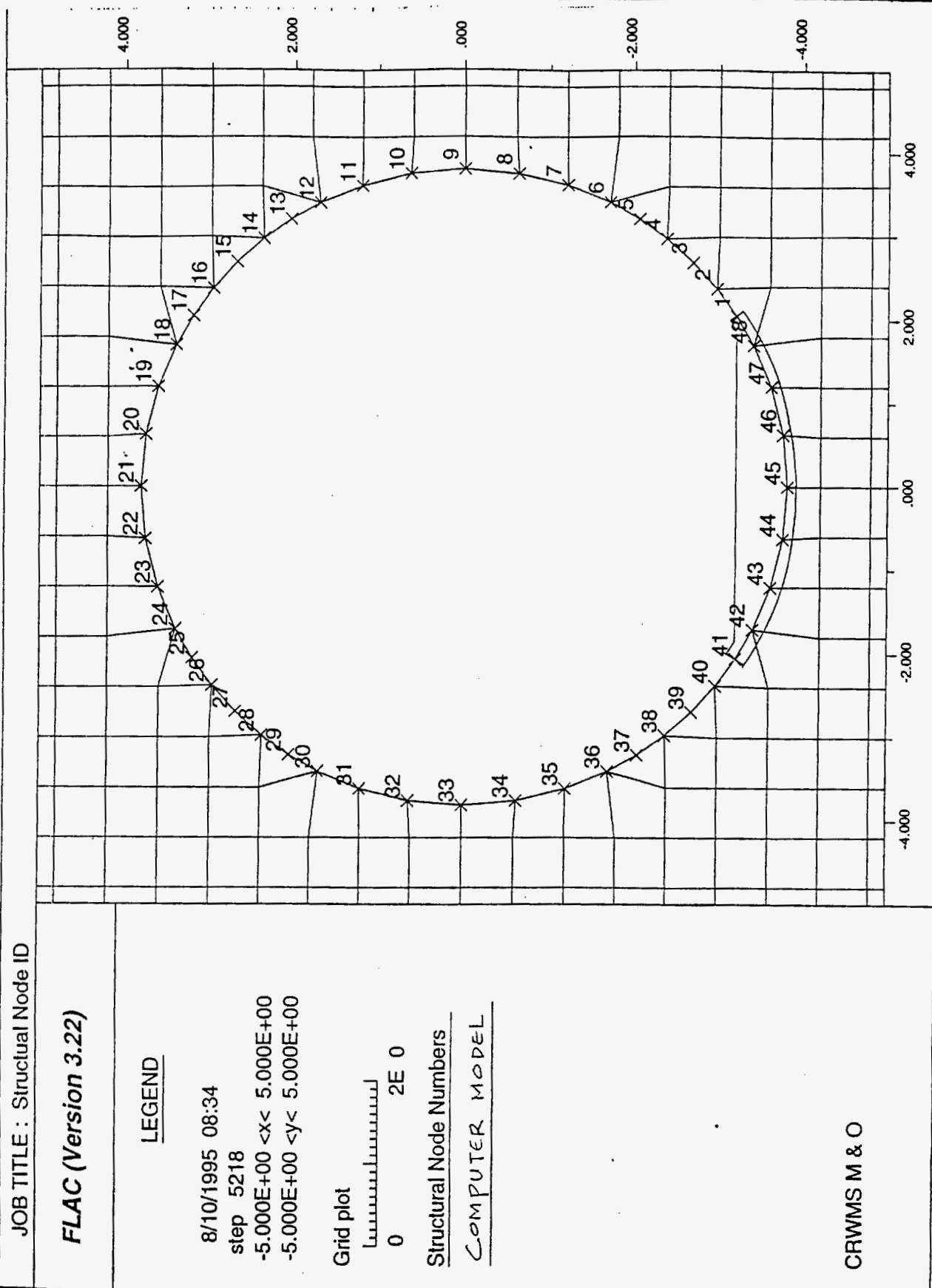
JACKING PROCESS CONCLUSIONS

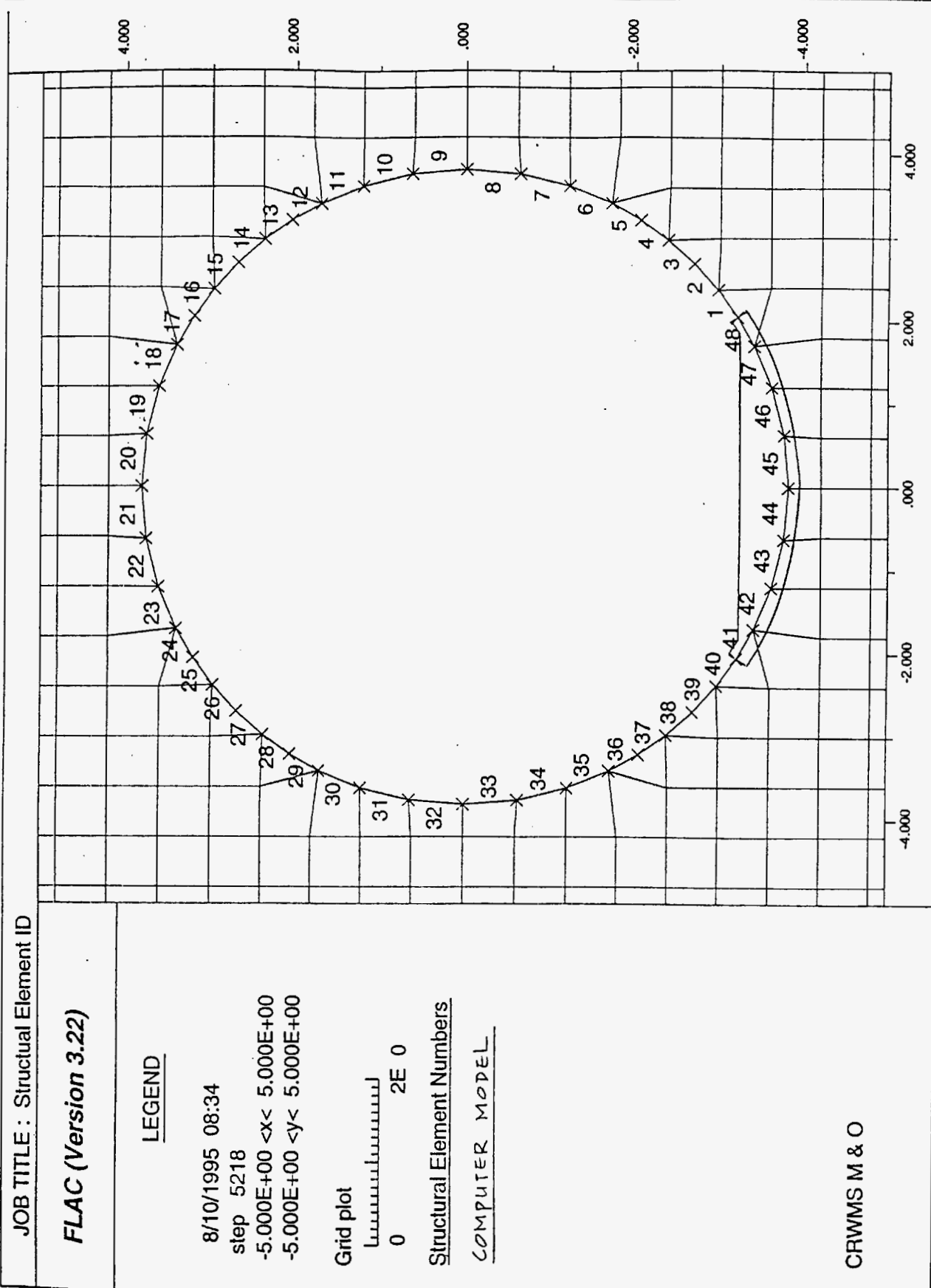
A W8X31 shape is selected as a trial member for the steel set ring member, to be verified in Attachment III, provided that the Contractor uses the following controls in the jacking procedure:

- The jacking force shall not exceed 27 tons per jack. (See File STLRV2 and Attachment III page III-27)
- The jack centerline position shall be no more than 6 inch from the X-X axis of the W8X31.
(see pages I-7 and I - 23).
- Jacking forces may be applied on both sides or one side only of the steel set, since stresses are the same in either condition. (See Summary of Computer Analyses for Jacking Loads).

ATTACHMENT IIROCK LONG-TERM LOAD COMPUTER ANALYSIS RESULTS

THIS ATTACHMENT CONTAINS THE COMPUTER ANALYSIS RESULTS EXTRACTED FROM ESF GROUND SUPPORT DESIGN ANALYSIS (REFERENCE 5.20). THE RESULTS PRESENTED HERE ARE THE REPRESENTATION OF THE CATEGORY I ROCK MASS PROPERTY LOADING FOR BOTH W 3 X 31 AND W 6 X 20 STEEL SETS. ONLY THE FORCE RESULTS IN STEEL SET ARE INCLUDED. THE COMPUTER ANALYSIS WAS PERFORMED BY THE GEOTECHNICAL GROUP. THE ANALYSIS HAS CONSIDERED DEAD LOAD, SEISMIC LOAD AND UTILITY LOADS ON THE STEEL SET AT VARIOUS STRATA ALONG THE ESF MAIN LOOP.





Title: ESF Ground Support - Structural Steel Analysis

Page: II-4 of II-62

STATION: PTN @ 10+00

LOADING: STATIC: DL+UTIL

STEEL SET: W8X31 @ 2'-0" O.C.

• FLAC log-file opened 7-Aug-95 8:59

From File : m10k250w.sav
>or stru

Structural node data ...

Node	X	Y	X-disp	Y-disp	Ang-disp	Xfix	Yfix	Rfix	
48	1.704E+00	-3.408E+00	1.129E-04	2.042E-03	-4.581E-04	no	no	no	
47	1.205E+00	-3.614E+00	4.070E-05	2.265E-03	-3.911E-04	no	no	no	
46	6.264E-01	-3.758E+00	1.114E-06	2.457E-03	-2.584E-04	no	no	no	
45	0.000E+00	-3.810E+00	-5.098E-06	2.544E-03	-2.606E-05	no	no	no	
44	-6.264E-01	-3.758E+00	-9.474E-06	2.481E-03	2.330E-04	no	no	no	
43	-1.205E+00	-3.614E+00	-4.786E-05	2.287E-03	4.021E-04	no	no	no	
42	-1.704E+00	-3.408E+00	-1.223E-04	2.066E-03	4.743E-04	no	no	no	
41	-2.053E+00	-3.209E+00	-2.023E-04	1.889E-03	0.000E+00	no	no	no	
40	-2.380E+00	-2.975E+00	-2.769E-04	1.612E-03	7.118E-04	no	no	no	
39	-2.694E+00	-2.694E+00	-4.027E-04	1.293E-03	7.904E-04	no	no	no	
38	-2.975E+00	-2.380E+00	-5.480E-04	9.557E-04	7.966E-04	no	no	no	
37	-3.209E+00	-2.053E+00	-7.041E-04	6.330E-04	7.365E-04	no	no	no	
36	-3.408E+00	-1.704E+00	-8.359E-04	3.427E-04	5.202E-04	no	no	no	
35	-3.614E+00	-1.205E+00	-9.258E-04	4.610E-05	2.646E-04	no	no	no	
34	-3.758E+00	-6.264E-01	-9.793E-04	-2.593E-04	1.465E-04	no	no	no	
33	-3.810E+00	0.000E+00	-9.967E-04	-5.825E-04	3.502E-06	no	no	no	
32	-3.758E+00	6.264E-01	-9.806E-04	-9.038E-04	-1.469E-04	no	no	no	
31	-3.614E+00	1.205E+00	-9.207E-04	-1.214E-03	-2.942E-04	no	no	no	
30	-3.408E+00	1.704E+00	-8.074E-04	-1.525E-03	-5.882E-04	no	no	no	
29	-3.209E+00	2.053E+00	-6.496E-04	-1.835E-03	-8.254E-04	no	no	no	
28	-2.975E+00	2.380E+00	-4.624E-04	-2.176E-03	-9.038E-04	no	no	no	
27	-2.694E+00	2.694E+00	-2.916E-04	-2.551E-03	-8.759E-04	no	no	no	
26	-2.380E+00	2.975E+00	-1.544E-04	-2.886E-03	-7.184E-04	no	no	no	
25	-2.053E+00	3.209E+00	-8.694E-05	-3.141E-03	-5.358E-04	no	no	no	
24	-1.704E+00	3.408E+00	-4.541E-05	-3.340E-03	-4.369E-04	no	no	no	
23	-1.205E+00	3.614E+00	-1.952E-05	-3.560E-03	-3.577E-04	no	no	no	
22	-6.264E-01	3.758E+00	-1.157E-07	-3.741E-03	-2.132E-04	no	no	no	
21	0.000E+00	3.810E+00	5.438E-06	-3.795E-03	2.951E-05	no	no	no	
20	6.264E-01	3.758E+00	1.031E-05	-3.702E-03	2.658E-04	no	no	no	
19	1.205E+00	3.614E+00	3.291E-05	-3.497E-03	3.939E-04	no	no	no	
18	1.704E+00	3.408E+00	6.387E-05	-3.263E-03	4.434E-04	no	no	no	
17	2.053E+00	3.209E+00	1.053E-04	-3.071E-03	5.222E-04	no	no	no	
16	2.380E+00	2.975E+00	1.714E-04	-2.825E-03	6.812E-04	no	no	no	
15	2.694E+00	2.694E+00	2.915E-04	-2.504E-03	8.125E-04	no	no	no	
14	2.975E+00	2.380E+00	4.473E-04	-2.148E-03	8.677E-04	no	no	no	
13	3.209E+00	2.053E+00	6.333E-04	-1.802E-03	8.774E-04	no	no	no	
12	3.408E+00	1.704E+00	7.988E-04	-1.485E-03	6.260E-04	no	no	no	
11	3.614E+00	1.205E+00	9.184E-04	-1.174E-03	3.447E-04	no	no	no	
10	3.758E+00	6.264E-01	9.837E-04	-8.643E-04	1.416E-04	no	no	no	
9	3.810E+00	0.000E+00	9.995E-04	-5.484E-04	-1.104E-05	no	no	no	
8	3.758E+00	-6.264E-01	9.739E-04	-2.327E-04	-1.511E-04	no	no	no	
7	3.614E+00	-1.205E+00	9.184E-04	6.737E-05	-2.723E-04	no	no	no	
6	3.408E+00	-1.704E+00	8.188E-04	3.635E-04	-5.402E-04	no	no	no	
5	3.209E+00	-2.053E+00	6.777E-04	6.588E-04	-7.621E-04	no	no	no	
4	2.975E+00	-2.380E+00	5.134E-04	9.789E-04	-8.096E-04	no	no	no	
3	2.694E+00	-2.694E+00	3.705E-04	1.312E-03	-7.434E-04	no	no	no	
2	2.380E+00	-2.975E+00	2.604E-04	1.609E-03	-6.549E-04	no	no	no	
1	2.053E+00	-3.209E+00	1.911E-04	1.865E-03	0.000E+00	no	no	no	
Node	X-load	Y-load	Moment	i	j	Pin	Sh. force	Angle	Bond
48	0.000E+00	0.000E+00	0.000E+00	39	30	no			
47	0.000E+00	0.000E+00	0.000E+00	38	30	no			
46	0.000E+00	0.000E+00	0.000E+00	37	30	no			
45	0.000E+00	0.000E+00	0.000E+00	36	30	no			

44	0.000E+00	0.000E+00	0.000E+00	35	30	no
43	0.000E+00	0.000E+00	0.000E+00	34	30	no
42	0.000E+00	0.000E+00	0.000E+00	33	30	no
41	0.000E+00	-9.099E+01	0.000E+00	33	31	yes
40	0.000E+00	-1.381E+03	0.000E+00	32	31	no
39	0.000E+00	-2.993E+03	0.000E+00	32	32	no
38	0.000E+00	-2.988E+03	0.000E+00	31	32	no
37	0.000E+00	-1.819E+02	0.000E+00	31	33	no
36	0.000E+00	-2.131E+02	0.000E+00	30	33	no
35	0.000E+00	-2.571E+02	0.000E+00	30	34	no
34	0.000E+00	-2.771E+02	0.000E+00	30	35	no
33	0.000E+00	-2.845E+02	0.000E+00	30	36	no
32	0.000E+00	-2.771E+02	0.000E+00	30	37	no
31	0.000E+00	-2.571E+02	0.000E+00	30	38	no
30	0.000E+00	-2.131E+02	0.000E+00	30	39	no
29	0.000E+00	-1.819E+02	0.000E+00	31	39	no
28	0.000E+00	-1.863E+02	0.000E+00	31	40	no
27	0.000E+00	-1.907E+02	0.000E+00	32	40	no
26	0.000E+00	-1.863E+02	0.000E+00	32	41	no
25	0.000E+00	-5.413E+03	0.000E+00	33	41	no
24	0.000E+00	-2.131E+02	0.000E+00	33	42	no
23	0.000E+00	-2.571E+02	0.000E+00	34	42	no
22	0.000E+00	-2.771E+02	0.000E+00	35	42	no
21	0.000E+00	-1.052E+04	0.000E+00	36	42	no
20	0.000E+00	-2.771E+02	0.000E+00	37	42	no
19	0.000E+00	-2.571E+02	0.000E+00	38	42	no
18	0.000E+00	-2.131E+02	0.000E+00	39	42	no
17	0.000E+00	-5.413E+03	0.000E+00	39	41	no
16	0.000E+00	-1.863E+02	0.000E+00	40	41	no
15	0.000E+00	-1.907E+02	0.000E+00	40	40	no
14	0.000E+00	-1.863E+02	0.000E+00	41	40	no
13	0.000E+00	-1.518E+04	9.085E+03	41	39	no
12	0.000E+00	-1.521E+04	9.085E+03	42	39	no
11	0.000E+00	-1.525E+04	9.085E+03	42	38	no
10	0.000E+00	-2.771E+02	0.000E+00	42	37	no
9	0.000E+00	-2.845E+02	0.000E+00	42	36	no
8	0.000E+00	-2.771E+02	0.000E+00	42	35	no
7	0.000E+00	-2.571E+02	0.000E+00	42	34	no
6	0.000E+00	-2.131E+02	0.000E+00	42	33	no
5	0.000E+00	-1.819E+02	0.000E+00	41	33	no
4	0.000E+00	-1.863E+02	0.000E+00	41	32	no
3	0.000E+00	-1.907E+02	0.000E+00	40	32	no
2	0.000E+00	-1.863E+02	0.000E+00	40	31	no
1	0.000E+00	-9.099E+01	0.000E+00	39	31	yes

Structural element data ...

Elem	ID	Nod1	Nod2	Prop		F-shear	F-axial	Mom-1	Mom-2
48	1	48	1	3	beam	1.805E+04	3.410E+05	7.253E+03	-7.597E-04
47	1	47	48	3	beam	3.049E+03	2.825E+05	8.901E+03	-7.254E+03
46	1	46	47	3	beam	1.874E+04	1.250E+05	2.007E+04	-8.902E+03
45	1	45	46	3	beam	1.271E+04	1.413E+04	2.806E+04	-2.007E+04
44	1	44	45	3	beam	-3.905E+03	1.173E+04	2.560E+04	-2.806E+04
43	1	43	44	3	beam	-2.397E+04	1.227E+05	1.132E+04	-2.560E+04
42	1	42	43	3	beam	-9.689E+03	2.891E+05	6.082E+03	-1.132E+04
41	1	41	42	3	beam	-1.513E+04	3.543E+05	-5.462E-04	-6.083E+03
40	2	40	41	2	beam	1.246E+04	4.875E+05	5.009E+03	1.872E-04
39	2	39	40	2	beam	-1.049E+04	5.488E+05	5.906E+02	-5.010E+03
38	2	38	39	2	beam	-1.759E+03	7.255E+05	-1.503E+02	-5.911E+02
37	2	37	38	2	beam	-1.042E+04	8.162E+05	-4.337E+03	1.477E+02
36	2	36	37	2	beam	-1.863E+04	9.068E+05	-1.182E+04	4.336E+03

35	2	35	36	2	beam	1.747E+04	8.610E+05	-2.383E+03	1.182E+04
34	2	34	35	2	beam	-1.985E+03	9.420E+05	-3.565E+03	2.382E+03
33	2	33	34	2	beam	4.821E+02	9.861E+05	-3.263E+03	3.566E+03
32	2	32	33	2	beam	-1.053E+03	9.899E+05	-3.924E+03	3.262E+03
31	2	31	32	2	beam	7.175E+02	9.502E+05	-3.495E+03	3.923E+03
30	2	30	31	2	beam	-1.730E+04	8.707E+05	-1.284E+04	3.496E+03
29	2	29	30	2	beam	1.981E+04	9.220E+05	-4.876E+03	1.284E+04
28	2	28	29	2	beam	9.680E+03	8.187E+05	-9.844E+02	4.875E+03
27	2	27	28	2	beam	9.388E+03	7.643E+05	2.971E+03	9.849E+02
26	2	26	27	2	beam	1.254E+04	5.683E+05	8.253E+03	-2.969E+03
25	2	25	26	2	beam	-7.132E+03	4.624E+05	5.385E+03	-8.251E+03
24	2	24	25	2	beam	-8.413E+03	2.882E+05	2.003E+03	-5.385E+03
23	2	23	24	2	beam	7.243E+02	2.178E+05	2.396E+03	-2.005E+03
22	2	22	23	2	beam	4.179E+03	7.996E+04	4.884E+03	-2.393E+03
21	2	21	22	2	beam	2.902E+03	-3.030E+03	6.709E+03	-4.885E+03
20	2	20	21	2	beam	-3.396E+03	5.596E+03	4.576E+03	-6.710E+03
19	2	19	20	2	beam	-4.519E+03	8.945E+04	1.880E+03	-4.573E+03
18	2	18	19	2	beam	-1.868E+03	2.188E+05	8.704E+02	-1.879E+03
17	2	17	18	2	beam	1.031E+04	2.779E+05	5.017E+03	-8.735E+02
16	2	16	17	2	beam	4.578E+03	4.457E+05	6.856E+03	-5.016E+03
15	2	15	16	2	beam	-1.035E+04	5.716E+05	2.496E+03	-6.857E+03
14	2	14	15	2	beam	-2.528E+03	7.514E+05	1.435E+03	-2.500E+03
13	2	13	14	2	beam	-5.343E+03	8.371E+05	-7.126E+02	-1.435E+03
12	2	12	13	2	beam	2.033E+03	9.393E+05	-8.980E+03	9.798E+03
11	2	11	12	2	beam	3.794E+04	8.681E+05	2.429E+03	1.806E+04
10	2	10	11	2	beam	5.168E+03	9.376E+05	-3.574E+03	6.654E+03
9	2	9	10	2	beam	-2.231E+02	9.701E+05	-3.715E+03	3.575E+03
8	2	8	9	2	beam	1.178E+03	9.666E+05	-2.975E+03	3.715E+03
7	2	7	8	2	beam	-2.511E+02	9.259E+05	-3.126E+03	2.976E+03
6	2	6	7	2	beam	-1.599E+04	8.476E+05	-1.176E+04	3.127E+03
5	2	5	6	2	beam	1.730E+04	8.952E+05	-4.809E+03	1.176E+04
4	2	4	5	2	beam	1.511E+04	8.020E+05	1.263E+03	4.811E+03
3	2	3	4	2	beam	5.194E+03	7.072E+05	3.451E+03	-1.263E+03
2	2	2	3	2	beam	-1.416E+03	5.300E+05	2.855E+03	-3.452E+03
1	2	1	2	2	beam	-7.099E+03	4.667E+05	-7.314E-06	-2.854E+03

Structural Properties ...

Prop Num.	Area	E	I	Dynamic Density	Plastic Moment
3	3.04800E-01	2.75800E+10	2.36000E-03	0.00000E+00	Not Set
2	5.90000E-03	3.27870E+11	4.57800E-05	0.00000E+00	Not Set
Prop. Num.	Cable Bond Stiffness	Cable Bond Strength	Yield Strength	Compressive Yield	Support Stiffness
3	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
2	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

> set log off

* log-file recording stopped 7-Aug-95 8:59

STATION: TSW1 @ 18+00

LOADING: STATIC: DL+UTIL

STEEL SET: W8X31 @ 4'-0" O.C.

* FLAC log-file opened 5-Aug-95 8:42

From File : m18k250w.sav

>pr stru

structural node data ...

Node	X	Y	X-disp	Y-disp	Ang-disp	Xfix	Yfix	Rfix	
48	1.704E+00	-3.408E+00	7.423E-05	1.625E-03	-2.621E-04	no	no	no	
47	1.205E+00	-3.614E+00	3.068E-05	1.744E-03	-1.949E-04	no	no	no	
46	6.264E-01	-3.758E+00	1.017E-05	1.828E-03	-1.012E-04	no	no	no	
45	0.000E+00	-3.810E+00	7.714E-06	1.849E-03	1.268E-05	no	no	no	
44	-6.264E-01	-3.758E+00	3.380E-06	1.813E-03	1.315E-04	no	no	no	
43	-1.205E+00	-3.614E+00	-2.070E-05	1.709E-03	2.165E-04	no	no	no	
42	-1.704E+00	-3.408E+00	-6.614E-05	1.587E-03	2.666E-04	no	no	no	
41	-2.053E+00	-3.209E+00	-1.148E-04	1.487E-03	0.000E+00	no	no	no	
40	-2.380E+00	-2.975E+00	-1.336E-04	1.360E-03	2.772E-04	no	no	no	
39	-2.694E+00	-2.694E+00	-1.634E-04	1.231E-03	2.824E-04	no	no	no	
38	-2.975E+00	-2.380E+00	-1.835E-04	1.076E-03	2.649E-04	no	no	no	
37	-3.209E+00	-2.053E+00	-1.933E-04	9.128E-04	2.686E-04	no	no	no	
36	-3.408E+00	-1.704E+00	-2.120E-04	7.240E-04	2.391E-04	no	no	no	
35	-3.614E+00	-1.205E+00	-2.074E-04	4.695E-04	1.380E-04	no	no	no	
34	-3.758E+00	-6.264E-01	-2.005E-04	1.471E-04	9.709E-05	no	no	no	
33	-3.810E+00	0.000E+00	-2.041E-04	-2.304E-04	3.711E-06	no	no	no	
32	-3.758E+00	6.264E-01	-2.032E-04	-6.049E-04	-9.814E-05	no	no	no	
31	-3.614E+00	1.205E+00	-2.138E-04	-9.372E-04	-1.201E-04	no	no	no	
30	-3.408E+00	1.704E+00	-2.245E-04	-1.189E-03	-2.562E-04	no	no	no	
29	-3.209E+00	2.053E+00	-1.953E-04	-1.392E-03	-3.172E-04	no	no	no	
28	-2.975E+00	2.380E+00	-1.784E-04	-1.564E-03	-2.725E-04	no	no	no	
27	-2.694E+00	2.694E+00	-1.638E-04	-1.719E-03	-2.603E-04	no	no	no	
26	-2.380E+00	2.975E+00	-1.407E-04	-1.843E-03	-2.645E-04	no	no	no	
25	-2.053E+00	3.209E+00	-1.154E-04	-1.959E-03	-2.778E-04	no	no	no	
24	-1.704E+00	3.408E+00	-7.995E-05	-2.053E-03	-2.150E-04	no	no	no	
23	-1.205E+00	3.614E+00	-5.530E-05	-2.155E-03	-2.079E-04	no	no	no	
22	-6.264E-01	3.758E+00	-1.871E-05	-2.298E-03	-2.605E-04	no	no	no	
21	0.000E+00	3.810E+00	-2.584E-06	-2.389E-03	6.708E-06	no	no	no	
20	6.264E-01	3.758E+00	1.590E-05	-2.287E-03	2.889E-04	no	no	no	
19	1.205E+00	3.614E+00	5.725E-05	-2.122E-03	2.560E-04	no	no	no	
18	1.704E+00	3.408E+00	8.134E-05	-2.007E-03	1.993E-04	no	no	no	
17	2.053E+00	3.209E+00	1.032E-04	-1.917E-03	2.533E-04	no	no	no	
16	2.380E+00	2.975E+00	1.253E-04	-1.798E-03	2.601E-04	no	no	no	
15	2.694E+00	2.694E+00	1.495E-04	-1.685E-03	2.447E-04	no	no	no	
14	2.975E+00	2.380E+00	1.621E-04	-1.540E-03	2.452E-04	no	no	no	
13	3.209E+00	2.053E+00	1.786E-04	-1.370E-03	3.780E-04	no	no	no	
12	3.408E+00	1.704E+00	2.132E-04	-1.162E-03	3.150E-04	no	no	no	
11	3.614E+00	1.205E+00	2.151E-04	-9.099E-04	2.188E-04	no	no	no	
10	3.758E+00	6.264E-01	2.096E-04	-5.809E-04	7.447E-05	no	no	no	
9	3.810E+00	0.000E+00	2.076E-04	-2.057E-04	9.770E-07	no	no	no	
8	3.758E+00	-6.264E-01	2.052E-04	1.731E-04	-1.001E-04	no	no	no	
7	3.614E+00	-1.205E+00	2.116E-04	5.039E-04	-1.410E-04	no	no	no	
6	3.408E+00	-1.704E+00	2.152E-04	7.609E-04	-2.494E-04	no	no	no	
5	3.209E+00	-2.053E+00	1.895E-04	9.511E-04	-2.773E-04	no	no	no	
4	2.975E+00	-2.380E+00	1.808E-04	1.112E-03	-2.599E-04	no	no	no	
3	2.694E+00	-2.694E+00	1.645E-04	1.269E-03	-2.706E-04	no	no	no	
2	2.380E+00	-2.975E+00	1.420E-04	1.400E-03	-2.736E-04	no	no	no	
1	2.053E+00	-3.209E+00	1.231E-04	1.524E-03	0.000E+00	no	no	no	
Node	X-load	Y-load	Moment	i	j	Pin	Sh. force	Angle	Bond
48	0.000E+00	0.000E+00	0.000E+00	39	30	no			
47	0.000E+00	0.000E+00	0.000E+00	38	30	no			
46	0.000E+00	0.000E+00	0.000E+00	37	30	no			
45	0.000E+00	0.000E+00	0.000E+00	36	30	no			

44	0.000E+00	0.000E+00	0.000E+00	35	30	no
43	0.000E+00	0.000E+00	0.000E+00	34	30	no
42	0.000E+00	0.000E+00	0.000E+00	33	30	no
41	0.000E+00	-9.099E+01	0.000E+00	33	31	yes
40	0.000E+00	-1.381E+03	0.000E+00	32	31	no
39	0.000E+00	-2.993E+03	0.000E+00	32	32	no
38	0.000E+00	-2.988E+03	0.000E+00	31	32	no
37	0.000E+00	-1.819E+02	0.000E+00	31	33	no
36	0.000E+00	-2.131E+02	0.000E+00	30	33	no
35	0.000E+00	-2.571E+02	0.000E+00	30	34	no
34	0.000E+00	-2.771E+02	0.000E+00	30	35	no
33	0.000E+00	-2.845E+02	0.000E+00	30	36	no
32	0.000E+00	-2.771E+02	0.000E+00	30	37	no
31	0.000E+00	-2.571E+02	0.000E+00	30	38	no
30	0.000E+00	-2.131E+02	0.000E+00	30	39	no
29	0.000E+00	-1.819E+02	0.000E+00	31	39	no
28	0.000E+00	-1.863E+02	0.000E+00	31	40	no
27	0.000E+00	-1.907E+02	0.000E+00	32	40	no
26	0.000E+00	-1.863E+02	0.000E+00	32	41	no
25	0.000E+00	-5.413E+03	0.000E+00	33	41	no
24	0.000E+00	-2.131E+02	0.000E+00	33	42	no
23	0.000E+00	-2.571E+02	0.000E+00	34	42	no
22	0.000E+00	-2.771E+02	0.000E+00	35	42	no
21	0.000E+00	-1.052E+04	0.000E+00	36	42	no
20	0.000E+00	-2.771E+02	0.000E+00	37	42	no
19	0.000E+00	-2.571E+02	0.000E+00	38	42	no
18	0.000E+00	-2.131E+02	0.000E+00	39	42	no
17	0.000E+00	-5.413E+03	0.000E+00	39	41	no
16	0.000E+00	-1.863E+02	0.000E+00	40	41	no
15	0.000E+00	-1.907E+02	0.000E+00	40	40	no
14	0.000E+00	-1.863E+02	0.000E+00	41	40	no
13	0.000E+00	-1.518E+04	9.085E+03	41	39	no
12	0.000E+00	-1.521E+04	9.085E+03	42	39	no
11	0.000E+00	-1.525E+04	9.085E+03	42	38	no
10	0.000E+00	-2.771E+02	0.000E+00	42	37	no
9	0.000E+00	-2.845E+02	0.000E+00	42	36	no
8	0.000E+00	-2.771E+02	0.000E+00	42	35	no
7	0.000E+00	-2.571E+02	0.000E+00	42	34	no
6	0.000E+00	-2.131E+02	0.000E+00	42	33	no
5	0.000E+00	-1.819E+02	0.000E+00	41	33	no
4	0.000E+00	-1.863E+02	0.000E+00	41	32	no
3	0.000E+00	-1.907E+02	0.000E+00	40	32	no
2	0.000E+00	-1.863E+02	0.000E+00	40	31	no
1	0.000E+00	-9.099E+01	0.000E+00	39	31	yes

Structural element data ...

Elem	ID	Nod1	Nod2	Prop		F-shear	F-axial	Mom-1	Mom-2
48	1	48	1	3	beam	1.655E+04	1.207E+05	6.651E+03	-7.684E-04
47	1	47	48	3	beam	5.372E+03	9.402E+04	9.552E+03	-6.650E+03
46	1	46	47	3	beam	2.290E+03	4.622E+03	1.092E+04	-9.551E+03
45	1	45	46	3	beam	2.783E+03	-1.150E+04	1.266E+04	-1.092E+04
44	1	44	45	3	beam	-1.164E+03	-1.018E+04	1.193E+04	-1.267E+04
43	1	43	44	3	beam	-8.901E+03	1.712E+04	6.630E+03	-1.194E+04
42	1	42	43	3	beam	-2.174E+03	9.187E+04	5.456E+03	-6.630E+03
41	1	41	42	3	beam	-1.358E+04	1.309E+05	1.105E-04	-5.459E+03
40	2	40	41	2	beam	-1.143E+03	1.442E+05	-4.594E+02	-8.322E-05
39	2	39	40	2	beam	2.624E+03	1.516E+05	6.461E+02	4.597E+02
38	2	38	39	2	beam	-4.544E+03	2.320E+05	-1.269E+03	-6.461E+02
37	2	37	38	2	beam	6.660E+03	3.090E+05	1.408E+03	1.269E+03
36	2	36	37	2	beam	-9.749E+03	3.697E+05	-2.511E+03	-1.408E+03

35	2	35	36	2	beam	4.093E+03	4.258E+05	-2.996E+02	2.510E+03
34	2	34	35	2	beam	-7.248E+02	5.141E+05	-7.317E+02	2.997E+02
33	2	33	34	2	beam	-1.221E+03	5.794E+05	-1.499E+03	7.317E+02
32	2	32	33	2	beam	8.996E+02	5.767E+05	-9.340E+02	1.499E+03
31	2	31	32	2	beam	2.205E+03	5.289E+05	3.806E+02	9.338E+02
30	2	30	31	2	beam	-8.412E+03	4.247E+05	-4.163E+03	-3.802E+02
29	2	29	30	2	beam	1.505E+04	3.925E+05	1.886E+03	4.164E+03
28	2	28	29	2	beam	-5.234E+03	3.155E+05	-2.177E+02	-1.886E+03
27	2	27	28	2	beam	2.072E+03	2.436E+05	6.552E+02	2.179E+02
26	2	26	27	2	beam	-3.463E+03	1.529E+05	-8.045E+02	-6.549E+02
25	2	25	26	2	beam	2.761E+03	1.190E+05	3.050E+02	8.046E+02
24	2	24	25	2	beam	4.317E+03	3.940E+04	2.040E+03	-3.052E+02
23	2	23	24	2	beam	-7.187E+03	2.440E+04	-1.842E+03	-2.040E+03
22	2	22	23	2	beam	3.958E+03	-1.096E+02	5.166E+02	1.842E+03
21	2	21	22	2	beam	8.514E+03	-1.259E+04	5.868E+03	-5.169E+02
20	2	20	21	2	beam	-7.947E+03	-1.277E+04	8.734E+02	-5.868E+03
19	2	19	20	2	beam	-4.319E+03	1.282E+03	-1.701E+03	-8.729E+02
18	2	18	19	2	beam	3.381E+03	3.830E+04	1.255E+02	1.701E+03
17	2	17	18	2	beam	4.397E+03	6.143E+04	1.893E+03	-1.255E+02
16	2	16	17	2	beam	-8.790E+03	1.224E+05	-1.641E+03	-1.892E+03
15	2	15	16	2	beam	6.484E+03	1.301E+05	1.092E+03	1.641E+03
14	2	14	15	2	beam	-5.140E+03	2.326E+05	-1.074E+03	-1.092E+03
13	2	13	14	2	beam	1.769E+04	3.142E+05	6.036E+03	1.074E+03
12	2	12	13	2	beam	9.316E+03	3.965E+05	6.957E+02	3.049E+03
11	2	11	12	2	beam	2.611E+04	4.166E+05	5.714E+03	8.389E+03
10	2	10	11	2	beam	5.213E+03	5.225E+05	-2.643E+02	3.371E+03
9	2	9	10	2	beam	-1.954E+03	5.770E+05	-1.492E+03	2.639E+02
8	2	8	9	2	beam	9.051E+02	5.833E+05	-9.228E+02	1.492E+03
7	2	7	8	2	beam	1.369E+03	5.259E+05	-1.071E+02	9.233E+02
6	2	6	7	2	beam	-5.181E+03	4.315E+05	-2.906E+03	1.070E+02
5	2	5	6	2	beam	1.187E+04	3.644E+05	1.864E+03	2.907E+03
4	2	4	5	2	beam	-7.659E+03	3.046E+05	-1.215E+03	-1.863E+03
3	2	3	4	2	beam	4.871E+03	2.417E+05	8.369E+02	1.216E+03
2	2	2	3	2	beam	-4.223E+03	1.638E+05	-9.428E+02	-8.365E+02
1	2	1	2	2	beam	2.345E+03	1.462E+05	2.073E-04	9.425E+02

Structural Properties ...

Prop Num.	Area	E	I	Dynamic Density	Plastic Moment
3	3.04800E-01	2.75800E+10	2.36000E-03	0.00000E+00	Not Set
2	5.90000E-03	1.64000E+11	4.57800E-05	0.00000E+00	Not Set
Prop. Num.	Cable Bond Stiffness	Cable Bond Strength	Yield Strength	Compressive Yield	Support Stiffness
3	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
2	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

>set log off

* log-file recording stopped 5-Aug-95 8:42

* FLAC log-file opened 2-Aug-95 15:44

From File : m07k250w.sav
>pr stru

STATION: TCW @ 7+00

LOADING: STATIC: DL+UTIL

STEEL SET: W8X31 @ 4'-0" O.C.

Structural node data ...

Node	X	Y	X-disp	Y-disp	Ang-disp	Xfix	Yfix	Rfix	
48	1.704E+00	-3.408E+00	1.027E-04	8.365E-04	-1.537E-04	no	no	no	
47	1.205E+00	-3.614E+00	6.510E-05	9.084E-04	-1.462E-04	no	no	no	
46	6.264E-01	-3.758E+00	3.118E-05	9.848E-04	-1.234E-04	no	no	no	
45	0.000E+00	-3.810E+00	2.577E-07	1.042E-03	-3.798E-05	no	no	no	
44	-6.264E-01	-3.758E+00	-2.723E-05	1.027E-03	7.945E-05	no	no	no	
43	-1.205E+00	-3.614E+00	-6.043E-05	9.648E-04	1.422E-04	no	no	no	
42	-1.704E+00	-3.408E+00	-1.015E-04	8.843E-04	1.868E-04	no	no	no	
41	-2.053E+00	-3.209E+00	-1.424E-04	8.158E-04	0.000E+00	no	no	no	
40	-2.380E+00	-2.975E+00	-1.757E-04	7.431E-04	1.843E-04	no	no	no	
39	-2.694E+00	-2.694E+00	-2.106E-04	6.727E-04	1.901E-04	no	no	no	
38	-2.975E+00	-2.380E+00	-2.453E-04	5.887E-04	1.808E-04	no	no	no	
37	-3.209E+00	-2.053E+00	-2.741E-04	5.132E-04	1.685E-04	no	no	no	
36	-3.408E+00	-1.704E+00	-2.989E-04	4.196E-04	1.575E-04	no	no	no	
35	-3.614E+00	-1.205E+00	-3.246E-04	3.053E-04	1.019E-04	no	no	no	
34	-3.758E+00	-6.264E-01	-3.429E-04	1.775E-04	5.791E-05	no	no	no	
33	-3.810E+00	0.000E+00	-3.495E-04	3.893E-05	1.112E-06	no	no	no	
32	-3.758E+00	6.264E-01	-3.451E-04	-9.878E-05	-5.362E-05	no	no	no	
31	-3.614E+00	1.205E+00	-3.293E-04	-2.245E-04	-9.608E-05	no	no	no	
30	-3.408E+00	1.704E+00	-3.055E-04	-3.347E-04	-1.492E-04	no	no	no	
29	-3.209E+00	2.053E+00	-2.809E-04	-4.251E-04	-1.686E-04	no	no	no	
28	-2.975E+00	2.380E+00	-2.551E-04	-5.013E-04	-1.663E-04	no	no	no	
27	-2.694E+00	2.694E+00	-2.284E-04	-5.788E-04	-1.735E-04	no	no	no	
26	-2.380E+00	2.975E+00	-1.973E-04	-6.490E-04	-1.780E-04	no	no	no	
25	-2.053E+00	3.209E+00	-1.700E-04	-7.202E-04	-1.864E-04	no	no	no	
24	-1.704E+00	3.408E+00	-1.370E-04	-7.843E-04	-1.633E-04	no	no	no	
23	-1.205E+00	3.614E+00	-9.993E-05	-8.547E-04	-1.477E-04	no	no	no	
22	-6.264E-01	3.758E+00	-5.410E-05	-9.304E-04	-1.023E-04	no	no	no	
21	0.000E+00	3.810E+00	-2.157E-06	-9.511E-04	1.188E-05	no	no	no	
20	6.264E-01	3.758E+00	4.947E-05	-9.213E-04	9.767E-05	no	no	no	
19	1.205E+00	3.614E+00	9.371E-05	-8.562E-04	1.294E-04	no	no	no	
18	1.704E+00	3.408E+00	1.297E-04	-7.918E-04	1.525E-04	no	no	no	
17	2.053E+00	3.209E+00	1.643E-04	-7.328E-04	1.861E-04	no	no	no	
16	2.380E+00	2.975E+00	1.924E-04	-6.609E-04	1.826E-04	no	no	no	
15	2.694E+00	2.694E+00	2.232E-04	-5.893E-04	1.767E-04	no	no	no	
14	2.975E+00	2.380E+00	2.501E-04	-5.109E-04	1.523E-04	no	no	no	
13	3.209E+00	2.053E+00	2.772E-04	-4.350E-04	2.281E-04	no	no	no	
12	3.408E+00	1.704E+00	3.054E-04	-3.459E-04	1.900E-04	no	no	no	
11	3.614E+00	1.205E+00	3.323E-04	-2.371E-04	1.849E-04	no	no	no	
10	3.758E+00	6.264E-01	3.522E-04	-1.086E-04	3.376E-05	no	no	no	
9	3.810E+00	0.000E+00	3.543E-04	2.922E-05	1.526E-06	no	no	no	
8	3.758E+00	-6.264E-01	3.469E-04	1.661E-04	-6.308E-05	no	no	no	
7	3.614E+00	-1.205E+00	3.243E-04	2.935E-04	-1.063E-04	no	no	no	
6	3.408E+00	-1.704E+00	2.990E-04	4.055E-04	-1.488E-04	no	no	no	
5	3.209E+00	-2.053E+00	2.739E-04	4.935E-04	-1.733E-04	no	no	no	
4	2.975E+00	-2.380E+00	2.422E-04	5.685E-04	-1.745E-04	no	no	no	
3	2.694E+00	-2.694E+00	2.118E-04	6.487E-04	-1.895E-04	no	no	no	
2	2.380E+00	-2.975E+00	1.716E-04	7.228E-04	-1.889E-04	no	no	no	
1	2.053E+00	-3.209E+00	1.352E-04	7.840E-04	0.000E+00	no	no	no	
Node	X-load	Y-load	Moment	i	j	Pin	Sh. force	Angle	Bond
48	0.000E+00	0.000E+00	0.000E+00	39	30	no			
47	0.000E+00	0.000E+00	0.000E+00	38	30	no			
46	0.000E+00	0.000E+00	0.000E+00	37	30	no			
45	0.000E+00	0.000E+00	0.000E+00	36	30	no			

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44	0.000E+00	0.000E+00	0.000E+00	35	30	no
43	0.000E+00	0.000E+00	0.000E+00	34	30	no
42	0.000E+00	0.000E+00	0.000E+00	33	30	no
41	0.000E+00	-9.099E+01	0.000E+00	33	31	yes
40	0.000E+00	-1.381E+03	0.000E+00	32	31	no
39	0.000E+00	-2.993E+03	0.000E+00	32	32	no
38	0.000E+00	-2.988E+03	0.000E+00	31	32	no
37	0.000E+00	-1.819E+02	0.000E+00	31	33	no
36	0.000E+00	-2.131E+02	0.000E+00	30	33	no
35	0.000E+00	-2.571E+02	0.000E+00	30	34	no
34	0.000E+00	-2.771E+02	0.000E+00	30	35	no
33	0.000E+00	-2.845E+02	0.000E+00	30	36	no
32	0.000E+00	-2.771E+02	0.000E+00	30	37	no
31	0.000E+00	-2.571E+02	0.000E+00	30	38	no
30	0.000E+00	-2.131E+02	0.000E+00	30	39	no
29	0.000E+00	-1.819E+02	0.000E+00	31	39	no
28	0.000E+00	-1.863E+02	0.000E+00	31	40	no
27	0.000E+00	-1.907E+02	0.000E+00	32	40	no
26	0.000E+00	-1.863E+02	0.000E+00	32	41	no
25	0.000E+00	-5.413E+03	0.000E+00	33	41	no
24	0.000E+00	-2.131E+02	0.000E+00	33	42	no
23	0.000E+00	-2.571E+02	0.000E+00	34	42	no
22	0.000E+00	-2.771E+02	0.000E+00	35	42	no
21	0.000E+00	-1.052E+04	0.000E+00	36	42	no
20	0.000E+00	-2.771E+02	0.000E+00	37	42	no
19	0.000E+00	-2.571E+02	0.000E+00	38	42	no
18	0.000E+00	-2.131E+02	0.000E+00	39	42	no
17	0.000E+00	-5.413E+03	0.000E+00	39	41	no
16	0.000E+00	-1.863E+02	0.000E+00	40	41	no
15	0.000E+00	-1.907E+02	0.000E+00	40	40	no
14	0.000E+00	-1.863E+02	0.000E+00	41	40	no
13	0.000E+00	-1.518E+04	9.085E+03	41	39	no
12	0.000E+00	-1.521E+04	9.085E+03	42	39	no
11	0.000E+00	-1.525E+04	9.085E+03	42	38	no
10	0.000E+00	-2.771E+02	0.000E+00	42	37	no
9	0.000E+00	-2.845E+02	0.000E+00	42	36	no
8	0.000E+00	-2.771E+02	0.000E+00	42	35	no
7	0.000E+00	-2.571E+02	0.000E+00	42	34	no
6	0.000E+00	-2.131E+02	0.000E+00	42	33	no
5	0.000E+00	-1.819E+02	0.000E+00	41	33	no
4	0.000E+00	-1.863E+02	0.000E+00	41	32	no
3	0.000E+00	-1.907E+02	0.000E+00	40	32	no
2	0.000E+00	-1.863E+02	0.000E+00	40	31	no
1	0.000E+00	-9.099E+01	0.000E+00	39	31	yes

Structural element data ...

Elem	ID	Nod1	Nod2	Prop		F-shear	F-axial	Mom-1	Mom-2
48	1	48	1	3	beam	-1.270E+03	-5.178E+04	-5.104E+02	-2.539E-04
47	1	47	48	3	beam	5.260E+03	-1.075E+05	2.324E+03	5.177E+02
46	1	46	47	3	beam	5.462E+02	-2.109E+05	2.647E+03	-2.321E+03
45	1	45	46	3	beam	1.974E+04	-3.577E+05	1.505E+04	-2.647E+03
44	1	44	45	3	beam	-9.200E+03	-3.420E+05	9.271E+03	-1.505E+04
43	1	43	44	3	beam	-8.124E+03	-2.519E+05	4.429E+03	-9.271E+03
42	1	42	43	3	beam	3.520E+03	-1.108E+05	6.332E+03	-4.431E+03
41	1	41	42	3	beam	-1.576E+04	-2.465E+04	9.477E-05	-6.336E+03
40	2	40	41	2	beam	-1.682E+03	3.749E+04	-6.762E+02	-3.738E-06
39	2	39	40	2	beam	3.699E+03	4.637E+04	8.824E+02	6.761E+02
38	2	38	39	2	beam	-4.972E+03	9.083E+04	-1.213E+03	-8.827E+02
37	2	37	38	2	beam	4.878E+03	1.098E+05	7.488E+02	1.212E+03
36	2	36	37	2	beam	-4.746E+03	1.650E+05	-1.159E+03	-7.489E+02

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					V	F-AXIAL	M-1	M-2	
35	2	35	36	2	beam	1.430E+03	1.711E+05	-3.868E+02	1.159E+03
34	2	34	35	2	beam	-5.591E+02	1.968E+05	-7.201E+02	3.869E+02
33	2	33	34	2	beam	1.319E+02	2.125E+05	-6.371E+02	7.200E+02
32	2	32	33	2	beam	-5.353E+01	2.105E+05	-6.706E+02	6.370E+02
31	2	31	32	2	beam	4.558E+02	1.943E+05	-3.990E+02	6.707E+02
30	2	30	31	2	beam	-1.259E+03	1.653E+05	-1.079E+03	3.987E+02
29	2	29	30	2	beam	3.564E+03	1.591E+05	3.547E+02	1.078E+03
28	2	28	29	2	beam	-1.547E+03	1.178E+05	-2.674E+02	-3.543E+02
27	2	27	28	2	beam	6.660E+02	9.180E+04	1.131E+01	2.694E+02
26	2	26	27	2	beam	-4.345E+02	5.391E+04	-1.716E+02	-1.148E+01
25	2	25	26	2	beam	6.988E+01	4.647E+04	-1.427E+02	1.707E+02
24	2	24	25	2	beam	2.867E+03	7.445E+03	1.008E+03	1.446E+02
23	2	23	24	2	beam	-2.932E+03	-1.291E+04	-5.760E+02	-1.008E+03
22	2	22	23	2	beam	3.859E+03	-4.303E+04	1.723E+03	5.775E+02
21	2	21	22	2	beam	-1.144E+03	-7.760E+04	1.004E+03	-1.723E+03
20	2	20	21	2	beam	6.363E+01	-7.503E+04	1.045E+03	-1.005E+03
19	2	19	20	2	beam	-2.163E+03	-4.469E+04	-2.449E+02	-1.044E+03
18	2	18	19	2	beam	2.097E+03	-1.755E+04	8.878E+02	2.450E+02
17	2	17	18	2	beam	-1.293E+03	1.104E+02	3.682E+02	-8.878E+02
16	2	16	17	2	beam	-2.181E+03	4.829E+04	-5.037E+02	-3.728E+02
15	2	15	16	2	beam	1.876E+03	5.586E+04	2.890E+02	5.015E+02
14	2	14	15	2	beam	-3.427E+03	9.133E+04	-1.157E+03	-2.873E+02
13	2	13	14	2	beam	1.282E+04	1.119E+05	3.994E+03	1.160E+03
12	2	12	13	2	beam	2.178E+04	1.516E+05	3.665E+03	5.091E+03
11	2	11	12	2	beam	1.980E+04	1.638E+05	5.278E+03	5.419E+03
10	2	10	11	2	beam	6.390E+03	1.965E+05	7.856E-01	3.808E+03
9	2	9	10	2	beam	-1.230E+03	2.123E+05	-7.715E+02	-1.439E+00
8	2	8	9	2	beam	3.706E-01	2.105E+05	-7.717E+02	7.719E+02
7	2	7	8	2	beam	7.654E+02	1.909E+05	-3.163E+02	7.726E+02
6	2	6	7	2	beam	-1.015E+03	1.689E+05	-8.644E+02	3.160E+02
5	2	5	6	2	beam	2.012E+03	1.574E+05	-5.481E+01	8.633E+02
4	2	4	5	2	beam	1.660E+02	1.052E+05	1.131E+01	5.543E+01
3	2	3	4	2	beam	-1.314E+03	8.943E+04	-5.432E+02	-1.036E+01
2	2	2	3	2	beam	2.629E+03	4.419E+04	5.639E+02	5.438E+02
1	2	1	2	2	beam	-1.403E+03	1.379E+04	-1.816E-05	-5.640E+02

Structural Properties ...

Prop Num.	Area	E	I	Dynamic Density	Plastic Moment
3	3.04800E-01	2.75800E+10	2.36000E-03	0.00000E+00	Not Set
2	5.90000E-03	1.64000E+11	4.57800E-05	0.00000E+00	Not Set
Prop. Cable Bond Num.	Cable Bond Stiffness	Cable Bond Strength	Yield Strength	Compressive Yield	Support Stiffness
3	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
2	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

>set log off

* log-file recording stopped 2-Aug-95 15:44

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* FLAC log-file opened 14-Aug-95 14:08

From File : flac.ini

>pr stru

m34k250x.sav

The following state has been restored:

date	time	step	grid	version
10-Aug-95	13:42	5218	70 X 70	3.22

Title:

>pr stru

Structural node data ...

Node	X	Y	X-disp	Y-disp	Ang-disp	Xfix	Yfix	Rfix
48	1.704E+00	-3.408E+00	2.196E-04	1.784E-03	-4.640E-04	no	no	no
47	1.205E+00	-3.614E+00	1.287E-04	1.998E-03	-3.870E-04	no	no	no
46	6.264E-01	-3.758E+00	4.900E-05	2.186E-03	-2.941E-04	no	no	no
45	0.000E+00	-3.810E+00	-7.204E-06	2.283E-03	-2.191E-05	no	no	no
44	-6.264E-01	-3.758E+00	-6.003E-05	2.200E-03	2.799E-04	no	no	no
43	-1.205E+00	-3.614E+00	-1.416E-04	2.019E-03	4.039E-04	no	no	no
42	-1.704E+00	-3.408E+00	-2.335E-04	1.797E-03	4.547E-04	no	no	no
41	-2.053E+00	-3.209E+00	-3.215E-04	1.632E-03	0.000E+00	no	no	no
40	-2.380E+00	-2.975E+00	-3.930E-04	1.441E-03	4.860E-04	no	no	no
39	-2.694E+00	-2.694E+00	-4.755E-04	1.237E-03	4.947E-04	no	no	no
38	-2.975E+00	-2.380E+00	-5.572E-04	1.022E-03	4.637E-04	no	no	no
37	-3.209E+00	-2.053E+00	-6.322E-04	8.199E-04	4.608E-04	no	no	no
36	-3.408E+00	-1.704E+00	-7.119E-04	5.838E-04	4.212E-04	no	no	no
35	-3.614E+00	-1.205E+00	-7.859E-04	2.982E-04	2.736E-04	no	no	no
34	-3.758E+00	-6.264E-01	-8.409E-04	-4.460E-05	1.672E-04	no	no	no
33	-3.810E+00	0.000E+00	-8.658E-04	-4.173E-04	1.336E-05	no	no	no
32	-3.758E+00	6.264E-01	-8.567E-04	-7.939E-04	-1.443E-04	no	no	no
31	-3.614E+00	1.205E+00	-8.145E-04	-1.143E-03	-2.660E-04	no	no	no
30	-3.408E+00	1.704E+00	-7.486E-04	-1.444E-03	-4.138E-04	no	no	no
29	-3.209E+00	2.053E+00	-6.778E-04	-1.683E-03	-4.464E-04	no	no	no
28	-2.975E+00	2.380E+00	-6.084E-04	-1.892E-03	-4.760E-04	no	no	no
27	-2.694E+00	2.694E+00	-5.312E-04	-2.127E-03	-5.194E-04	no	no	no
26	-2.380E+00	2.975E+00	-4.500E-04	-2.338E-03	-4.988E-04	no	no	no
25	-2.053E+00	3.209E+00	-3.801E-04	-2.542E-03	-4.958E-04	no	no	no
24	-1.704E+00	3.408E+00	-3.068E-04	-2.720E-03	-4.699E-04	no	no	no
23	-1.205E+00	3.614E+00	-2.172E-04	-2.951E-03	-4.822E-04	no	no	no
22	-6.264E-01	3.758E+00	-1.134E-04	-3.196E-03	-3.691E-04	no	no	no
21	0.000E+00	3.810E+00	-1.026E-06	-3.321E-03	-1.173E-05	no	no	no
20	6.264E-01	3.758E+00	1.111E-04	-3.207E-03	3.702E-04	no	no	no
19	1.205E+00	3.614E+00	2.126E-04	-2.958E-03	4.814E-04	no	no	no
18	1.704E+00	3.408E+00	2.983E-04	-2.726E-03	4.560E-04	no	no	no
17	2.053E+00	3.209E+00	3.718E-04	-2.549E-03	4.935E-04	no	no	no
16	2.380E+00	2.975E+00	4.427E-04	-2.354E-03	5.060E-04	no	no	no
15	2.694E+00	2.694E+00	5.231E-04	-2.139E-03	5.156E-04	no	no	no
14	2.975E+00	2.380E+00	5.971E-04	-1.905E-03	4.622E-04	no	no	no
13	3.209E+00	2.053E+00	6.670E-04	-1.696E-03	4.932E-04	no	no	no
12	3.408E+00	1.704E+00	7.443E-04	-1.443E-03	4.488E-04	no	no	no
11	3.614E+00	1.205E+00	8.154E-04	-1.150E-03	3.052E-04	no	no	no
10	3.758E+00	6.264E-01	8.546E-04	-8.077E-04	1.248E-04	no	no	no
9	3.810E+00	0.000E+00	8.632E-04	-4.395E-04	-6.536E-06	no	no	no
8	3.758E+00	-6.264E-01	8.413E-04	-7.385E-05	-1.639E-04	no	no	no
7	3.614E+00	-1.205E+00	7.882E-04	2.669E-04	-2.690E-04	no	no	no
6	3.408E+00	-1.704E+00	7.177E-04	5.497E-04	-4.103E-04	no	no	no
5	3.209E+00	-2.053E+00	6.357E-04	7.849E-04	-4.736E-04	no	no	no
4	2.975E+00	-2.380E+00	5.589E-04	9.913E-04	-4.727E-04	no	no	no

Node	X-load	Y-load	Moment	i	j	Pin	Sh. force	Angle	Bond
3	2.694E+00	-2.694E+00	4.774E-04	1.207E-03	-4.952E-04	no	no	no	
2	2.380E+00	-2.975E+00	3.896E-04	1.411E-03	-5.062E-04	no	no	no	
1	2.053E+00	-3.209E+00	3.130E-04	1.614E-03	0.000E+00	no	no	no	
48	0.000E+00	0.000E+00	0.000E+00	39	30	no			
47	0.000E+00	0.000E+00	0.000E+00	38	30	no			
46	0.000E+00	0.000E+00	0.000E+00	37	30	no			
45	0.000E+00	0.000E+00	0.000E+00	36	30	no			
44	0.000E+00	0.000E+00	0.000E+00	35	30	no			
43	0.000E+00	0.000E+00	0.000E+00	34	30	no			
42	0.000E+00	0.000E+00	0.000E+00	33	30	no			
41	0.000E+00	-9.099E+01	0.000E+00	33	31	yes			
40	0.000E+00	-1.381E+03	0.000E+00	32	31	no			
39	0.000E+00	-2.993E+03	0.000E+00	32	32	no			
38	0.000E+00	-2.988E+03	0.000E+00	31	32	no			
37	0.000E+00	-1.819E+02	0.000E+00	31	33	no			
36	0.000E+00	-2.131E+02	0.000E+00	30	33	no			
35	0.000E+00	-2.571E+02	0.000E+00	30	34	no			
34	0.000E+00	-2.771E+02	0.000E+00	30	35	no			
33	0.000E+00	-2.845E+02	0.000E+00	30	36	no			
32	0.000E+00	-2.771E+02	0.000E+00	30	37	no			
31	0.000E+00	-2.571E+02	0.000E+00	30	38	no			
30	0.000E+00	-2.131E+02	0.000E+00	30	39	no			
29	0.000E+00	-1.819E+02	0.000E+00	31	39	no			
28	0.000E+00	-1.863E+02	0.000E+00	31	40	no			
27	0.000E+00	-1.907E+02	0.000E+00	32	40	no			
26	0.000E+00	-1.863E+02	0.000E+00	32	41	no			
25	0.000E+00	-5.413E+03	0.000E+00	33	41	no			
24	0.000E+00	-2.131E+02	0.000E+00	33	42	no			
23	0.000E+00	-2.571E+02	0.000E+00	34	42	no			
22	0.000E+00	-2.771E+02	0.000E+00	35	42	no			
21	0.000E+00	-1.052E+04	0.000E+00	36	42	no			
20	0.000E+00	-2.771E+02	0.000E+00	37	42	no			
19	0.000E+00	-2.571E+02	0.000E+00	38	42	no			
18	0.000E+00	-2.131E+02	0.000E+00	39	42	no			
17	0.000E+00	-5.413E+03	0.000E+00	39	41	no			
16	0.000E+00	-1.863E+02	0.000E+00	40	41	no			
15	0.000E+00	-1.907E+02	0.000E+00	40	40	no			
14	0.000E+00	-1.863E+02	0.000E+00	41	40	no			
13	0.000E+00	-1.518E+04	9.085E+03	41	39	no			
12	0.000E+00	-1.521E+04	9.085E+03	42	39	no			
11	0.000E+00	-1.525E+04	9.085E+03	42	38	no			
10	0.000E+00	-2.771E+02	0.000E+00	42	37	no			
9	0.000E+00	-2.845E+02	0.000E+00	42	36	no			
8	0.000E+00	-2.771E+02	0.000E+00	42	35	no			
7	0.000E+00	-2.571E+02	0.000E+00	42	34	no			
6	0.000E+00	-2.131E+02	0.000E+00	42	33	no			
5	0.000E+00	-1.819E+02	0.000E+00	41	33	no			
4	0.000E+00	-1.863E+02	0.000E+00	41	32	no			
3	0.000E+00	-1.907E+02	0.000E+00	40	32	no			
2	0.000E+00	-1.863E+02	0.000E+00	40	31	no			
1	0.000E+00	-9.099E+01	0.000E+00	39	31	yes			

Structural element data ...

Elem	ID	Nod1	Nod2	Prop		F-shear	F-axial	Mom-1	Mom-2
48	1	48	1	3	beam	3.282E+04	1.111E+05	1.319E+04	6.566E-04
47	1	47	48	3	beam	-1.450E+04	-7.535E+04	5.360E+03	-1.319E+04
46	1	46	47	3	beam	1.604E+04	-3.914E+05	1.492E+04	-5.359E+03
45	1	45	46	3	beam	4.224E+04	-6.514E+05	4.147E+04	-1.492E+04
44	1	44	45	3	beam	-3.251E+04	-6.602E+05	2.104E+04	-4.147E+04

43	1	43	44	3	beam	-2.514E+04	-3.961E+05	6.053E+03	-2.104E+04
42	1	42	43	3	beam	2.438E+02	-5.945E+04	6.183E+03	-6.052E+03
41	1	41	42	3	beam	-1.538E+04	1.082E+05	8.291E-04	-6.183E+03
40	2	40	41	2	beam	-2.068E+03	2.647E+05	-8.314E+02	-1.172E-04
39	2	39	40	2	beam	5.408E+03	3.220E+05	1.448E+03	8.312E+02
38	2	38	39	2	beam	-1.211E+04	5.061E+05	-3.653E+03	-1.448E+03
37	2	37	38	2	beam	1.762E+04	5.864E+05	3.430E+03	3.653E+03
36	2	36	37	2	beam	-2.443E+04	7.838E+05	-6.388E+03	-3.430E+03
35	2	35	36	2	beam	8.470E+03	8.558E+05	-1.813E+03	6.388E+03
34	2	34	35	2	beam	-2.906E+03	1.037E+06	-3.545E+03	1.813E+03
33	2	33	34	2	beam	-4.145E+02	1.145E+06	-3.805E+03	3.544E+03
32	2	32	33	2	beam	1.297E+02	1.163E+06	-3.723E+03	3.805E+03
31	2	31	32	2	beam	2.213E+03	1.062E+06	-2.405E+03	3.724E+03
30	2	30	31	2	beam	-6.313E+03	9.208E+05	-5.814E+03	2.404E+03
29	2	29	30	2	beam	2.288E+04	8.380E+05	3.383E+03	5.815E+03
28	2	28	29	2	beam	-2.234E+04	6.163E+05	-5.596E+03	-3.383E+03
27	2	27	28	2	beam	1.922E+04	5.719E+05	2.503E+03	5.595E+03
26	2	26	27	2	beam	-8.391E+03	3.806E+05	-1.033E+03	-2.503E+03
25	2	25	26	2	beam	5.699E+03	2.874E+05	1.258E+03	1.032E+03
24	2	24	25	2	beam	-1.453E+03	1.172E+05	6.735E+02	-1.258E+03
23	2	23	24	2	beam	-3.758E+03	2.373E+04	-1.356E+03	-6.736E+02
22	2	22	23	2	beam	1.411E+04	-1.283E+05	7.052E+03	1.356E+03
21	2	21	22	2	beam	4.719E+03	-3.143E+05	1.002E+04	-7.052E+03
20	2	20	21	2	beam	-2.854E+03	-3.188E+05	8.224E+03	-1.002E+04
19	2	19	20	2	beam	-1.819E+04	-1.150E+05	-2.621E+03	-8.224E+03
18	2	18	19	2	beam	7.088E+03	3.579E+04	1.208E+03	2.621E+03
17	2	17	18	2	beam	9.514E+02	1.024E+05	1.591E+03	-1.209E+03
16	2	16	17	2	beam	-5.608E+03	2.832E+05	-6.609E+02	-1.593E+03
15	2	15	16	2	beam	4.778E+03	3.899E+05	1.349E+03	6.640E+02
14	2	14	15	2	beam	-1.542E+04	5.753E+05	-5.150E+03	-1.348E+03
13	2	13	14	2	beam	3.137E+04	6.281E+05	7.462E+03	5.149E+03
12	2	12	13	2	beam	-1.638E+02	8.448E+05	-1.689E+03	1.623E+03
11	2	11	12	2	beam	2.511E+04	8.978E+05	2.794E+03	1.077E+04
10	2	10	11	2	beam	5.869E+03	1.048E+06	-2.794E+03	6.292E+03
9	2	9	10	2	beam	-1.090E+03	1.135E+06	-3.480E+03	2.795E+03
8	2	8	9	2	beam	-8.926E+02	1.124E+06	-4.040E+03	3.479E+03
7	2	7	8	2	beam	4.681E+03	1.035E+06	-1.249E+03	4.040E+03
6	2	6	7	2	beam	-9.918E+03	8.496E+05	-6.607E+03	1.250E+03
5	2	5	6	2	beam	2.112E+04	7.863E+05	1.880E+03	6.607E+03
4	2	4	5	2	beam	-9.167E+03	5.898E+05	-1.806E+03	-1.879E+03
3	2	3	4	2	beam	4.766E+03	4.946E+05	2.012E+02	1.807E+03
2	2	2	3	2	beam	-2.811E+03	3.258E+05	-9.838E+02	-2.008E+02
1	2	1	2	2	beam	2.449E+03	2.539E+05	4.451E-05	9.842E+02

Structural Properties ...

Prop Num.	Area	E	I	Dynamic Density	Plastic Moment
3	3.04800E-01	2.75800E+10	2.36000E-03	0.00000E+00	Not Set
2	5.90000E-03	3.27870E+11	4.57800E-05	0.00000E+00	Not Set
Prop. Num.	Cable Bond Stiffness	Cable Bond Strength	Yield Strength	Compressive Yield	Support Stiffness
3	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
2	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

setlog off

log-file recording stopped 14-Aug-95 14:09

* FLAC log-file opened 9-Aug-95 14:17

From File : p10k2dy.sav

>pr stru

STATION: PTN @ 10+00

LOADING: SEISMIC + DL+UTIL

STEEL SET: W8X31 @ 2'-0" O.C.

Structural node data ...

Node	X	Y	X-disp	Y-disp	Ang-disp	Xfix	Yfix	Rfix
48	1.704E+00	-3.408E+00	2.040E-03	-1.827E-03	-5.381E-04	no	no	no
47	1.205E+00	-3.614E+00	1.969E-03	-1.569E-03	-4.280E-04	no	no	no
46	6.264E-01	-3.758E+00	1.942E-03	-1.366E-03	-2.480E-04	no	no	no
45	0.000E+00	-3.810E+00	1.953E-03	-1.296E-03	2.272E-05	no	no	no
44	-6.264E-01	-3.758E+00	1.961E-03	-1.401E-03	3.126E-04	no	no	no
43	-1.205E+00	-3.614E+00	1.927E-03	-1.656E-03	5.199E-04	no	no	no
42	-1.704E+00	-3.408E+00	1.841E-03	-1.954E-03	6.343E-04	no	no	no
41	-2.053E+00	-3.209E+00	1.740E-03	-2.198E-03	0.000E+00	no	no	no
40	-2.380E+00	-2.975E+00	1.647E-03	-2.622E-03	1.039E-03	no	no	no
39	-2.694E+00	-2.694E+00	1.487E-03	-3.095E-03	1.112E-03	no	no	no
38	-2.975E+00	-2.380E+00	1.306E-03	-3.580E-03	1.054E-03	no	no	no
37	-3.209E+00	-2.053E+00	1.125E-03	-4.020E-03	9.308E-04	no	no	no
36	-3.408E+00	-1.704E+00	9.764E-04	-4.420E-03	6.577E-04	no	no	no
35	-3.614E+00	-1.205E+00	8.842E-04	-4.844E-03	3.287E-04	no	no	no
34	-3.758E+00	-6.264E-01	8.375E-04	-5.285E-03	1.669E-04	no	no	no
33	-3.810E+00	0.000E+00	8.360E-04	-5.748E-03	-3.152E-05	no	no	no
32	-3.758E+00	6.264E-01	8.811E-04	-6.208E-03	-2.402E-04	no	no	no
31	-3.614E+00	1.205E+00	9.841E-04	-6.652E-03	-4.495E-04	no	no	no
30	-3.408E+00	1.704E+00	1.157E-03	-7.095E-03	-8.363E-04	no	no	no
29	-3.209E+00	2.053E+00	1.378E-03	-7.527E-03	-1.138E-03	no	no	no
28	-2.975E+00	2.380E+00	1.634E-03	-7.997E-03	-1.244E-03	no	no	no
27	-2.694E+00	2.694E+00	1.866E-03	-8.517E-03	-1.199E-03	no	no	no
26	-2.380E+00	2.975E+00	2.043E-03	-8.980E-03	-9.607E-04	no	no	no
25	-2.053E+00	3.209E+00	2.118E-03	-9.323E-03	-6.802E-04	no	no	no
24	-1.704E+00	3.408E+00	2.149E-03	-9.577E-03	-5.059E-04	no	no	no
23	-1.205E+00	3.614E+00	2.147E-03	-9.829E-03	-3.638E-04	no	no	no
22	-6.264E-01	3.758E+00	2.132E-03	-1.001E-02	-1.919E-04	no	no	no
21	0.000E+00	3.810E+00	2.103E-03	-1.005E-02	6.558E-05	no	no	no
20	6.264E-01	3.758E+00	2.071E-03	-9.930E-03	3.031E-04	no	no	no
19	1.205E+00	3.614E+00	2.054E-03	-9.684E-03	4.808E-04	no	no	no
18	1.704E+00	3.408E+00	2.058E-03	-9.356E-03	6.432E-04	no	no	no
17	2.053E+00	3.209E+00	2.098E-03	-9.052E-03	7.986E-04	no	no	no
16	2.380E+00	2.975E+00	2.182E-03	-8.667E-03	1.014E-03	no	no	no
15	2.694E+00	2.694E+00	2.342E-03	-8.186E-03	1.161E-03	no	no	no
14	2.975E+00	2.380E+00	2.546E-03	-7.675E-03	1.164E-03	no	no	no
13	3.209E+00	2.053E+00	2.771E-03	-7.205E-03	1.111E-03	no	no	no
12	3.408E+00	1.704E+00	2.966E-03	-6.773E-03	7.932E-04	no	no	no
11	3.614E+00	1.205E+00	3.103E-03	-6.335E-03	4.288E-04	no	no	no
10	3.758E+00	6.264E-01	3.171E-03	-5.891E-03	1.747E-04	no	no	no
9	3.810E+00	0.000E+00	3.179E-03	-5.437E-03	-3.327E-05	no	no	no
8	3.758E+00	-6.264E-01	3.133E-03	-4.983E-03	-2.273E-04	no	no	no
7	3.614E+00	-1.205E+00	3.050E-03	-4.549E-03	-3.944E-04	no	no	no
6	3.408E+00	-1.704E+00	2.914E-03	-4.126E-03	-7.324E-04	no	no	no
5	3.209E+00	-2.053E+00	2.734E-03	-3.721E-03	-9.993E-04	no	no	no
4	2.975E+00	-2.380E+00	2.527E-03	-3.288E-03	-1.073E-03	no	no	no
3	2.694E+00	-2.694E+00	2.345E-03	-2.827E-03	-1.017E-03	no	no	no
2	2.380E+00	-2.975E+00	2.207E-03	-2.406E-03	-9.031E-04	no	no	no
1	2.053E+00	-3.209E+00	2.127E-03	-2.041E-03	0.000E+00	no	no	no
Node	X-load	Y-load	Moment	i j Pin	Sh. force	Angle	Bond	
48	0.000E+00	0.000E+00	0.000E+00	39 30	no			
47	0.000E+00	0.000E+00	0.000E+00	38 30	no			
46	0.000E+00	0.000E+00	0.000E+00	37 30	no			
45	0.000E+00	0.000E+00	0.000E+00	36 30	no			

Title: ESF Ground Support - Structural Steel Analysis

44	0.000E+00	0.000E+00	0.000E+00	35	30	no
43	0.000E+00	0.000E+00	0.000E+00	34	30	no
42	0.000E+00	0.000E+00	0.000E+00	33	30	no
41	0.000E+00	-9.099E+01	0.000E+00	33	31	yes
40	0.000E+00	-1.381E+03	0.000E+00	32	31	no
39	0.000E+00	-2.993E+03	0.000E+00	32	32	no
38	0.000E+00	-2.988E+03	0.000E+00	31	32	no
37	0.000E+00	-1.819E+02	0.000E+00	31	33	no
36	0.000E+00	-2.131E+02	0.000E+00	30	33	no
35	0.000E+00	-2.571E+02	0.000E+00	30	34	no
34	0.000E+00	-2.771E+02	0.000E+00	30	35	no
33	0.000E+00	-2.845E+02	0.000E+00	30	36	no
32	0.000E+00	-2.771E+02	0.000E+00	30	37	no
31	0.000E+00	-2.571E+02	0.000E+00	30	38	no
30	0.000E+00	-2.131E+02	0.000E+00	30	39	no
29	0.000E+00	-1.819E+02	0.000E+00	31	39	no
28	0.000E+00	-1.863E+02	0.000E+00	31	40	no
27	0.000E+00	-1.907E+02	0.000E+00	32	40	no
26	0.000E+00	-1.863E+02	0.000E+00	32	41	no
25	0.000E+00	-5.413E+03	0.000E+00	33	41	no
24	0.000E+00	-2.131E+02	0.000E+00	33	42	no
23	0.000E+00	-2.571E+02	0.000E+00	34	42	no
22	0.000E+00	-2.771E+02	0.000E+00	35	42	no
21	0.000E+00	-1.052E+04	0.000E+00	36	42	no
20	0.000E+00	-2.771E+02	0.000E+00	37	42	no
19	0.000E+00	-2.571E+02	0.000E+00	38	42	no
18	0.000E+00	-2.131E+02	0.000E+00	39	42	no
17	0.000E+00	-5.413E+03	0.000E+00	39	41	no
16	0.000E+00	-1.863E+02	0.000E+00	40	41	no
15	0.000E+00	-1.907E+02	0.000E+00	40	40	no
14	0.000E+00	-1.863E+02	0.000E+00	41	40	no
13	0.000E+00	-1.518E+04	9.085E+03	41	39	no
12	0.000E+00	-1.521E+04	9.085E+03	42	39	no
11	0.000E+00	-1.525E+04	9.085E+03	42	38	no
10	0.000E+00	-2.771E+02	0.000E+00	42	37	no
9	0.000E+00	-2.845E+02	0.000E+00	42	36	no
8	0.000E+00	-2.771E+02	0.000E+00	42	35	no
7	0.000E+00	-2.571E+02	0.000E+00	42	34	no
6	0.000E+00	-2.131E+02	0.000E+00	42	33	no
5	0.000E+00	-1.819E+02	0.000E+00	41	33	no
4	0.000E+00	-1.863E+02	0.000E+00	41	32	no
3	0.000E+00	-1.907E+02	0.000E+00	40	32	no
2	0.000E+00	-1.863E+02	0.000E+00	40	31	no
1	0.000E+00	-9.099E+01	0.000E+00	39	31	yes

Structural element data ...

Elem	ID	Nod1	Nod2	Prop		F-shear	F-axial	Mom-1	Mom-2
48	1	48	1	3	beam	2.946E+04	5.693E+05	1.184E+04	-3.379E-04
47	1	47	48	3	beam	5.757E+03	5.106E+05	1.480E+04	-1.169E+04
46	1	46	47	3	beam	1.654E+04	3.308E+05	2.458E+04	-1.472E+04
45	1	45	46	3	beam	1.060E+04	2.177E+05	3.136E+04	-2.470E+04
44	1	44	45	3	beam	-5.685E+03	2.312E+05	2.824E+04	-3.182E+04
43	1	43	44	3	beam	-2.058E+04	3.771E+05	1.651E+04	-2.878E+04
42	1	42	43	3	beam	-1.030E+04	5.811E+05	1.100E+04	-1.657E+04
41	1	41	42	3	beam	-2.737E+04	6.597E+05	-2.812E-04	-1.100E+04
40	2	40	41	2	beam	1.350E+04	8.288E+05	5.425E+03	2.297E-05
39	2	39	40	2	beam	-1.371E+04	9.084E+05	-2.830E+02	-5.494E+03
38	2	38	39	2	beam	-9.147E+03	1.117E+06	-3.974E+03	1.192E+02
37	2	37	38	2	beam	-3.449E+03	1.207E+06	-5.301E+03	3.915E+03
36	2	36	37	2	beam	-2.412E+04	1.324E+06	-1.505E+04	5.357E+03

35	2	35	36	2	beam	2.168E+04	1.279E+06	-3.287E+03	1.500E+04
34	2	34	35	2	beam	-2.755E+03	1.375E+06	-4.897E+03	3.255E+03
33	2	33	34	2	beam	1.843E+02	1.419E+06	-4.682E+03	4.798E+03
32	2	32	33	2	beam	-1.059E+03	1.407E+06	-5.306E+03	4.640E+03
31	2	31	32	2	beam	9.126E+02	1.340E+06	-5.000E+03	5.544E+03
30	2	30	31	2	beam	-2.100E+04	1.226E+06	-1.642E+04	5.080E+03
29	2	29	30	2	beam	2.517E+04	1.282E+06	-6.203E+03	1.632E+04
28	2	28	29	2	beam	1.157E+04	1.131E+06	-1.631E+03	6.280E+03
27	2	27	28	2	beam	1.511E+04	1.069E+06	4.773E+03	1.593E+03
26	2	26	27	2	beam	1.761E+04	8.268E+05	1.220E+04	-4.780E+03
25	2	25	26	2	beam	-9.095E+03	6.785E+05	8.650E+03	-1.231E+04
24	2	24	25	2	beam	-1.085E+04	4.625E+05	4.330E+03	-8.689E+03
23	2	23	24	2	beam	-1.245E+03	3.552E+05	3.612E+03	-4.285E+03
22	2	22	23	2	beam	2.456E+03	1.892E+05	5.064E+03	-3.600E+03
21	2	21	22	2	beam	3.618E+03	9.972E+04	7.281E+03	-5.007E+03
20	2	20	21	2	beam	-5.310E+03	1.263E+05	4.004E+03	-7.342E+03
19	2	19	20	2	beam	1.710E+03	2.464E+05	4.981E+03	-3.962E+03
18	2	18	19	2	beam	-2.019E+03	4.368E+05	3.969E+03	-5.060E+03
17	2	17	18	2	beam	8.646E+03	5.504E+05	7.557E+03	-4.081E+03
16	2	16	17	2	beam	2.533E+03	7.647E+05	8.524E+03	-7.505E+03
15	2	15	16	2	beam	-1.572E+04	9.190E+05	1.946E+03	-8.570E+03
14	2	14	15	2	beam	-8.992E+03	1.137E+06	-1.782E+03	-2.007E+03
13	2	13	14	2	beam	-7.199E+02	1.215E+06	-2.142E+03	1.853E+03
12	2	12	13	2	beam	-2.814E+03	1.349E+06	-1.243E+04	1.130E+04
11	2	11	12	2	beam	4.195E+04	1.267E+06	1.210E+03	2.145E+04
10	2	10	11	2	beam	4.843E+03	1.356E+06	-4.958E+03	7.844E+03
9	2	9	10	2	beam	2.642E+01	1.397E+06	-4.959E+03	4.976E+03
8	2	8	9	2	beam	1.227E+03	1.387E+06	-4.254E+03	5.026E+03
7	2	7	8	2	beam	-2.018E+02	1.326E+06	-4.272E+03	4.152E+03
6	2	6	7	2	beam	-1.897E+04	1.218E+06	-1.451E+04	4.261E+03
5	2	5	6	2	beam	2.258E+04	1.260E+06	-5.428E+03	1.451E+04
4	2	4	5	2	beam	1.336E+04	1.126E+06	-6.017E+01	5.431E+03
3	2	3	4	2	beam	9.299E+03	1.026E+06	3.931E+03	-1.232E+01
2	2	2	3	2	beam	5.240E+02	8.119E+05	4.187E+03	-3.966E+03
1	2	1	2	2	beam	-1.025E+04	7.314E+05	2.214E-04	-4.121E+03

Structural Properties ...

Prop Num.	Area	E	I	Dynamic Density	Plastic Moment
3	3.04800E-01	2.75800E+10	2.36000E-03	0.00000E+00	Not Set
2	5.90000E-03	3.27870E+11	4.57800E-05	0.00000E+00	Not Set
Prop. Num.	Cable Bond Stiffness	Cable Bond Strength	Yield Strength	Compressive Yield	Support Stiffness
3	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
2	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

>set log off

* log-file recording stopped 9-Aug-95 14:17

JOB TITLE : Seismic Model @ 10+00: Cat-1, Ko=0.25, W/ Internal Loads, W8x31 Steel Set

FLAC (Version 3.22)

LEGEND

9/08/1995 15:29

step 8220

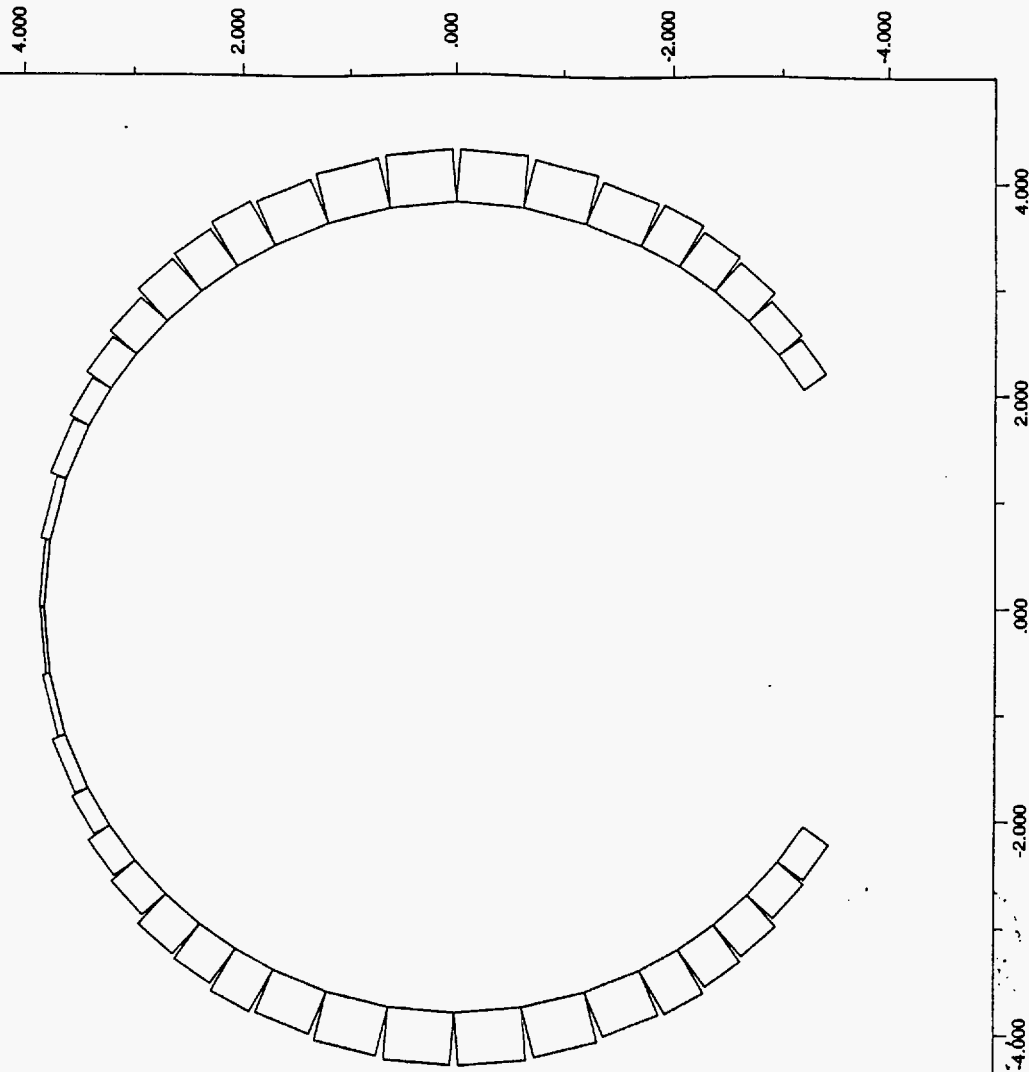
-5.000E+00 <x< 5.000E+00

-5.000E+00 <y< 5.000E+00

Axial Force on Beam 2

Max Value = 1.419E+06

CRWMS M & O



JOB TITLE : Seismic Model @ 10+00: Cat-1, Ko=0.25, W/ Internal Loads, W8x31 Steel Set

FLAC (Version 3.22)

LEGEND

9/08/1995 15:29

step 8220

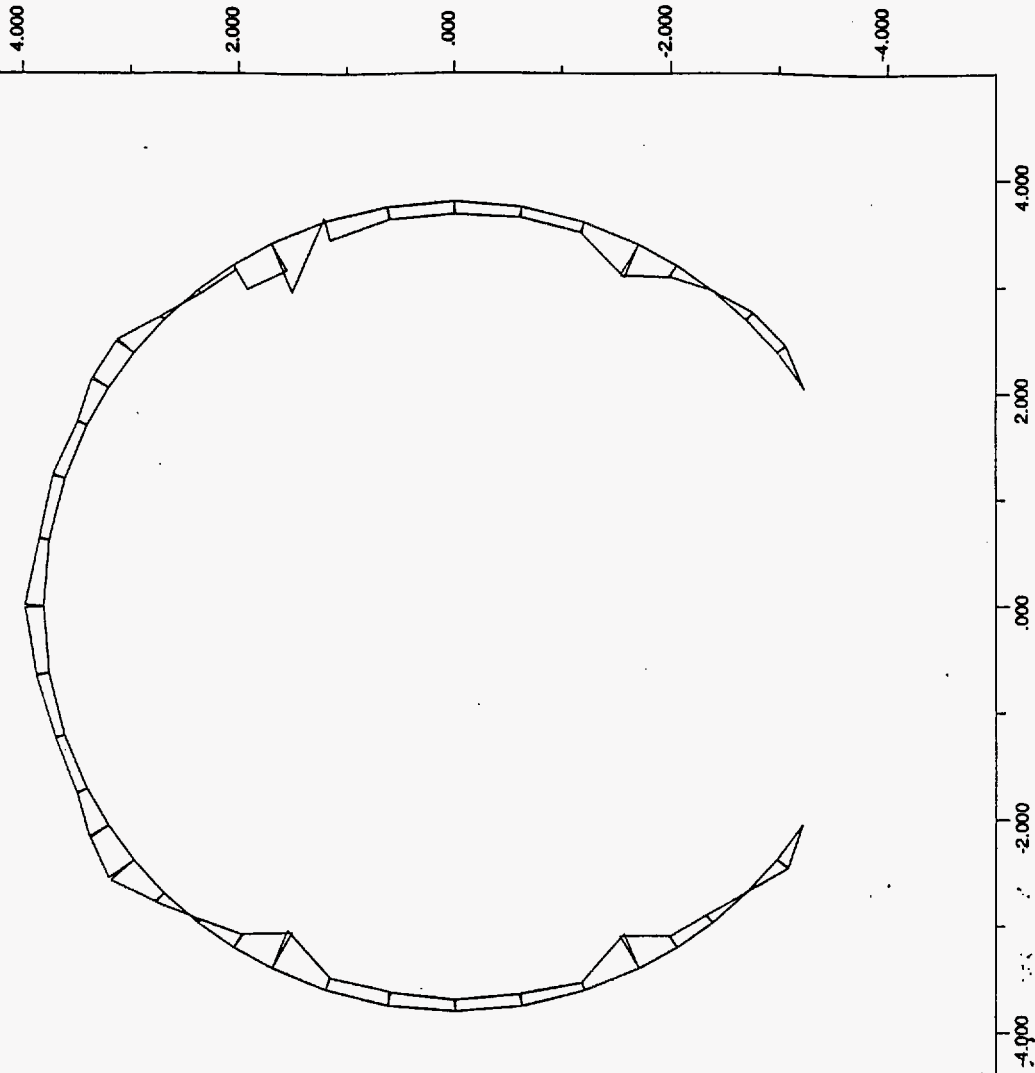
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-5.000E+00 <y< 5.000E+00

Moment on Beam 2

Max Value = -2.145E+04

CRWMS M & O



JOB TITLE : Seismic Model @ 10+00: Cat-1, Ko=0.25, W/ Internal Loads, W8x31 Steel Set

FLAC (Version 3.22)

LEGEND

9/08/1995 15:29

step 8220

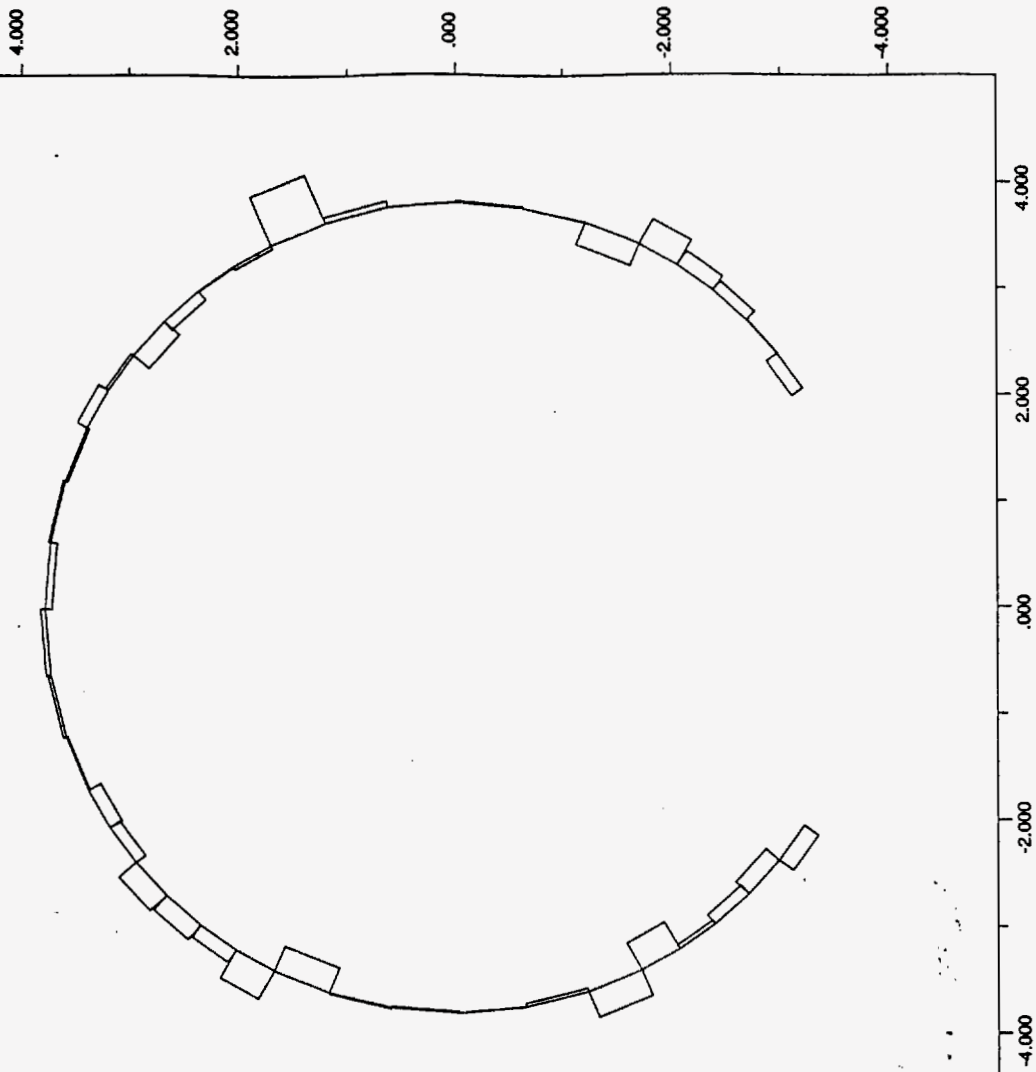
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-5.000E+00 <y< 5.000E+00

Shear Force on Beam 2

Max Value = 4.195E+04

CRWMS M & O



* FLAC log-file opened 9-Aug-95 14:12

STATION: TCW @ 7+00

From File : p07k2dy.sav

LOADING: SEISMIC + DL+UTIL

>pr stru

STEEL SET: W8X31 @ 4'-0" O.C.

Structural node data ...

Node	X	Y	X-disp	Y-disp	Ang-disp	Xfix	Yfix	Rfix	
48	1.704E+00	-3.408E+00	1.630E-03	-6.819E-03	-2.086E-04	no	no	no	
47	1.205E+00	-3.614E+00	1.590E-03	-6.723E-03	-1.793E-04	no	no	no	
46	6.264E-01	-3.758E+00	1.558E-03	-6.639E-03	-1.002E-04	no	no	no	
45	0.000E+00	-3.810E+00	1.535E-03	-6.615E-03	2.086E-05	no	no	no	
44	-6.264E-01	-3.758E+00	1.509E-03	-6.665E-03	1.360E-04	no	no	no	
43	-1.205E+00	-3.614E+00	1.475E-03	-6.767E-03	2.103E-04	no	no	no	
42	-1.704E+00	-3.408E+00	1.430E-03	-6.881E-03	2.435E-04	no	no	no	
41	-2.053E+00	-3.209E+00	1.384E-03	-6.969E-03	0.000E+00	no	no	no	
40	-2.380E+00	-2.975E+00	1.356E-03	-7.081E-03	2.582E-04	no	no	no	
39	-2.694E+00	-2.694E+00	1.322E-03	-7.195E-03	2.709E-04	no	no	no	
38	-2.975E+00	-2.380E+00	1.288E-03	-7.332E-03	2.595E-04	no	no	no	
37	-3.209E+00	-2.053E+00	1.257E-03	-7.455E-03	2.422E-04	no	no	no	
36	-3.408E+00	-1.704E+00	1.226E-03	-7.599E-03	2.240E-04	no	no	no	
35	-3.614E+00	-1.205E+00	1.197E-03	-7.783E-03	1.525E-04	no	no	no	
34	-3.758E+00	-6.264E-01	1.173E-03	-7.992E-03	8.272E-05	no	no	no	
33	-3.810E+00	0.000E+00	1.169E-03	-8.214E-03	-5.715E-06	no	no	no	
32	-3.758E+00	6.264E-01	1.179E-03	-8.436E-03	-8.582E-05	no	no	no	
31	-3.614E+00	1.205E+00	1.202E-03	-8.638E-03	-1.467E-04	no	no	no	
30	-3.408E+00	1.704E+00	1.232E-03	-8.815E-03	-2.166E-04	no	no	no	
29	-3.209E+00	2.053E+00	1.262E-03	-8.953E-03	-2.341E-04	no	no	no	
28	-2.975E+00	2.380E+00	1.292E-03	-9.069E-03	-2.402E-04	no	no	no	
27	-2.694E+00	2.694E+00	1.323E-03	-9.193E-03	-2.531E-04	no	no	no	
26	-2.380E+00	2.975E+00	1.359E-03	-9.298E-03	-2.451E-04	no	no	no	
25	-2.053E+00	3.209E+00	1.387E-03	-9.402E-03	-2.428E-04	no	no	no	
24	-1.704E+00	3.408E+00	1.421E-03	-9.487E-03	-2.077E-04	no	no	no	
23	-1.205E+00	3.614E+00	1.455E-03	-9.582E-03	-1.799E-04	no	no	no	
22	-6.264E-01	3.758E+00	1.498E-03	-9.673E-03	-1.188E-04	no	no	no	
21	0.000E+00	3.810E+00	1.546E-03	-9.701E-03	2.158E-05	no	no	no	
20	6.264E-01	3.758E+00	1.594E-03	-9.650E-03	1.327E-04	no	no	no	
19	1.205E+00	3.614E+00	1.635E-03	-9.559E-03	1.943E-04	no	no	no	
18	1.704E+00	3.408E+00	1.668E-03	-9.446E-03	2.357E-04	no	no	no	
17	2.053E+00	3.209E+00	1.700E-03	-9.349E-03	2.627E-04	no	no	no	
16	2.380E+00	2.975E+00	1.724E-03	-9.236E-03	2.574E-04	no	no	no	
15	2.694E+00	2.694E+00	1.752E-03	-9.120E-03	2.540E-04	no	no	no	
14	2.975E+00	2.380E+00	1.776E-03	-8.991E-03	2.220E-04	no	no	no	
13	3.209E+00	2.053E+00	1.803E-03	-8.868E-03	2.993E-04	no	no	no	
12	3.408E+00	1.704E+00	1.833E-03	-8.723E-03	2.547E-04	no	no	no	
11	3.614E+00	1.205E+00	1.857E-03	-8.541E-03	2.206E-04	no	no	no	
10	3.758E+00	6.264E-01	1.874E-03	-8.332E-03	5.434E-05	no	no	no	
9	3.810E+00	0.000E+00	1.877E-03	-8.107E-03	2.913E-06	no	no	no	
8	3.758E+00	-6.264E-01	1.870E-03	-7.884E-03	-8.511E-05	no	no	no	
7	3.614E+00	-1.205E+00	1.848E-03	-7.677E-03	-1.456E-04	no	no	no	
6	3.408E+00	-1.704E+00	1.821E-03	-7.495E-03	-2.193E-04	no	no	no	
5	3.209E+00	-2.053E+00	1.792E-03	-7.352E-03	-2.375E-04	no	no	no	
4	2.975E+00	-2.380E+00	1.762E-03	-7.235E-03	-2.435E-04	no	no	no	
3	2.694E+00	-2.694E+00	1.730E-03	-7.107E-03	-2.511E-04	no	no	no	
2	2.380E+00	-2.975E+00	1.697E-03	-7.001E-03	-2.420E-04	no	no	no	
1	2.053E+00	-3.209E+00	1.671E-03	-6.896E-03	0.000E+00	no	no	no	
Node	X-load	Y-load	Moment	i	j	Pin	Sh. force	Angle	Bond
48	0.000E+00	0.000E+00	0.000E+00	39	30	no			
47	0.000E+00	0.000E+00	0.000E+00	38	30	no			
46	0.000E+00	0.000E+00	0.000E+00	37	30	no			
45	0.000E+00	0.000E+00	0.000E+00	36	30	no			

44	0.000E+00	0.000E+00	0.000E+00	35	30	no
43	0.000E+00	0.000E+00	0.000E+00	34	30	no
42	0.000E+00	0.000E+00	0.000E+00	33	30	no
41	0.000E+00	-9.099E+01	0.000E+00	33	31	yes
40	0.000E+00	-1.381E+03	0.000E+00	32	31	no
39	0.000E+00	-2.993E+03	0.000E+00	32	32	no
38	0.000E+00	-2.988E+03	0.000E+00	31	32	no
37	0.000E+00	-1.819E+02	0.000E+00	31	33	no
36	0.000E+00	-2.131E+02	0.000E+00	30	33	no
35	0.000E+00	-2.571E+02	0.000E+00	30	34	no
34	0.000E+00	-2.771E+02	0.000E+00	30	35	no
33	0.000E+00	-2.845E+02	0.000E+00	30	36	no
32	0.000E+00	-2.771E+02	0.000E+00	30	37	no
31	0.000E+00	-2.571E+02	0.000E+00	30	38	no
30	0.000E+00	-2.131E+02	0.000E+00	30	39	no
29	0.000E+00	-1.819E+02	0.000E+00	31	39	no
28	0.000E+00	-1.863E+02	0.000E+00	31	40	no
27	0.000E+00	-1.907E+02	0.000E+00	32	40	no
26	0.000E+00	-1.863E+02	0.000E+00	32	41	no
25	0.000E+00	-5.413E+03	0.000E+00	33	41	no
24	0.000E+00	-2.131E+02	0.000E+00	33	42	no
23	0.000E+00	-2.571E+02	0.000E+00	34	42	no
22	0.000E+00	-2.771E+02	0.000E+00	35	42	no
21	0.000E+00	-1.052E+04	0.000E+00	36	42	no
20	0.000E+00	-2.771E+02	0.000E+00	37	42	no
19	0.000E+00	-2.571E+02	0.000E+00	38	42	no
18	0.000E+00	-2.131E+02	0.000E+00	39	42	no
17	0.000E+00	-5.413E+03	0.000E+00	39	41	no
16	0.000E+00	-1.863E+02	0.000E+00	40	41	no
15	0.000E+00	-1.907E+02	0.000E+00	40	40	no
14	0.000E+00	-1.863E+02	0.000E+00	41	40	no
13	0.000E+00	-1.518E+04	9.085E+03	41	39	no
12	0.000E+00	-1.521E+04	9.085E+03	42	39	no
11	0.000E+00	-1.525E+04	9.085E+03	42	38	no
10	0.000E+00	-2.771E+02	0.000E+00	42	37	no
9	0.000E+00	-2.845E+02	0.000E+00	42	36	no
8	0.000E+00	-2.771E+02	0.000E+00	42	35	no
7	0.000E+00	-2.571E+02	0.000E+00	42	34	no
6	0.000E+00	-2.131E+02	0.000E+00	42	33	no
5	0.000E+00	-1.819E+02	0.000E+00	41	33	no
4	0.000E+00	-1.863E+02	0.000E+00	41	32	no
3	0.000E+00	-1.907E+02	0.000E+00	40	32	no
2	0.000E+00	-1.863E+02	0.000E+00	40	31	no
1	0.000E+00	-9.099E+01	0.000E+00	39	31	yes

Structural element data ...

Elem	ID	Nod1	Nod2	Prop		F-shear	F-axial	Mom-1	Mom-2
48	1	48	1	3	beam	6.615E+03	4.946E+04	2.659E+03	2.891E-04
47	1	47	48	3	beam	3.295E+03	-3.546E+03	4.401E+03	-2.621E+03
46	1	46	47	3	beam	1.356E+04	-1.582E+05	1.269E+04	-4.613E+03
45	1	45	46	3	beam	-3.830E+02	-2.858E+05	1.241E+04	-1.265E+04
44	1	44	45	3	beam	-2.592E+03	-2.812E+05	1.112E+04	-1.275E+04
43	1	43	44	3	beam	-9.723E+03	-1.324E+05	5.211E+03	-1.101E+04
42	1	42	43	3	beam	-2.983E+03	2.392E+04	3.186E+03	-4.797E+03
41	1	41	42	3	beam	-6.926E+03	7.383E+04	-2.296E-05	-2.784E+03
40	2	40	41	2	beam	-1.342E+03	1.048E+05	-5.393E+02	9.698E-05
39	2	39	40	2	beam	3.775E+03	1.172E+05	1.021E+03	5.700E+02
38	2	38	39	2	beam	-5.586E+03	1.808E+05	-1.384E+03	-9.701E+02
37	2	37	38	2	beam	5.482E+03	1.975E+05	7.788E+02	1.425E+03
36	2	36	37	2	beam	-5.770E+03	2.665E+05	-1.496E+03	-8.231E+02

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35	2	35	36	2	beam	1.782E+03	2.857E+05	-5.119E+02	1.474E+03
34	2	34	35	2	beam	-1.230E+03	3.199E+05	-1.245E+03	5.118E+02
33	2	33	34	2	beam	7.088E+02	3.416E+05	-8.317E+02	1.277E+03
32	2	32	33	2	beam	-2.091E+02	3.402E+05	-1.024E+03	8.931E+02
31	2	31	32	2	beam	9.684E+02	3.113E+05	-4.792E+02	1.056E+03
30	2	30	31	2	beam	-2.015E+03	2.710E+05	-1.517E+03	4.285E+02
29	2	29	30	2	beam	5.780E+03	2.523E+05	8.340E+02	1.489E+03
28	2	28	29	2	beam	-4.414E+03	1.886E+05	-9.993E+02	-7.748E+02
27	2	27	28	2	beam	3.264E+03	1.653E+05	4.561E+02	9.193E+02
26	2	26	27	2	beam	-1.575E+03	1.006E+05	-1.826E+02	-4.811E+02
25	2	25	26	2	beam	1.944E+03	8.876E+04	4.321E+02	3.495E+02
24	2	24	25	2	beam	1.239E+03	3.161E+04	8.999E+02	-4.018E+02
23	2	23	24	2	beam	-2.441E+03	8.560E+03	-2.714E+02	-1.047E+03
22	2	22	23	2	beam	3.536E+03	-3.293E+04	1.825E+03	2.827E+02
21	2	21	22	2	beam	-1.989E+02	-7.116E+04	1.612E+03	-1.737E+03
20	2	20	21	2	beam	-8.895E+02	-6.683E+04	1.045E+03	-1.604E+03
19	2	19	20	2	beam	-1.003E+03	-2.862E+04	4.775E+02	-1.075E+03
18	2	18	19	2	beam	1.282E+02	2.052E+04	6.174E+02	-5.481E+02
17	2	17	18	2	beam	-3.545E+02	4.992E+04	4.357E+02	-5.782E+02
16	2	16	17	2	beam	-1.732E+03	1.146E+05	-4.462E+02	-2.499E+02
15	2	15	16	2	beam	2.426E+03	1.284E+05	4.459E+02	5.764E+02
14	2	14	15	2	beam	-4.737E+03	1.842E+05	-1.568E+03	-4.285E+02
13	2	13	14	2	beam	1.542E+04	2.068E+05	4.533E+03	1.663E+03
12	2	12	13	2	beam	1.857E+04	2.666E+05	2.904E+03	4.562E+03
11	2	11	12	2	beam	2.092E+04	2.825E+05	5.177E+03	6.124E+03
10	2	10	11	2	beam	6.119E+03	3.255E+05	-2.712E+02	3.918E+03
9	2	9	10	2	beam	-1.077E+03	3.449E+05	-9.490E+02	2.723E+02
8	2	8	9	2	beam	-2.388E+02	3.425E+05	-1.130E+03	9.802E+02
7	2	7	8	2	beam	1.123E+03	3.198E+05	-4.257E+02	1.095E+03
6	2	6	7	2	beam	-2.392E+03	2.800E+05	-1.669E+03	3.771E+02
5	2	5	6	2	beam	7.011E+03	2.687E+05	1.066E+03	1.752E+03
4	2	4	5	2	beam	-5.819E+03	1.894E+05	-1.281E+03	-1.059E+03
3	2	3	4	2	beam	5.606E+03	1.697E+05	1.049E+03	1.314E+03
2	2	2	3	2	beam	-3.172E+03	1.053E+05	-5.019E+02	-8.347E+02
1	2	1	2	2	beam	1.695E+03	9.691E+04	-1.222E-05	6.813E+02

Structural Properties ...

Prop Num.	Area	E	I	Dynamic Density	Plastic Moment
3	3.04800E-01	2.75800E+10	2.36000E-03	0.00000E+00	Not Set
2	5.90000E-03	1.64000E+11	4.57800E-05	0.00000E+00	Not Set
Prop. Num.	Cable Bond Stiffness	Cable Bond Strength	Yield Strength	Compressive Yield	Support Stiffness
3	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
2	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

>set log off

* log-file recording stopped 9-Aug-95 14:12

* FLAC log-file opened 9-Aug-95 14:13

From File : p07k2dy.sav

stru

Structural node data ...

Node	X	Y	X-disp	Y-disp	Ang-disp	Xfix	Yfix	Rfix
48	1.704E+00	-3.408E+00	1.630E-03	-6.819E-03	-2.086E-04	no	no	no

Title: ESF Ground Support - Structural Steel Analysis

* FLAC log-file opened 9-Aug-95 14:12

STATION: TSW1 @ 18+00

From File : p18k2dy.sav
>pr stru

LOADING: SEISMIC + DL+UTIL

STEEL SET: W8X31 @ 4'-0" O.C.

Structural node data ...

Node	X	Y	X-disp	Y-disp	Ang-disp	Xfix	Yfix	Rfix	
48	1.704E+00	-3.408E+00	1.620E-03	-2.294E-03	-2.920E-04	no	no	no	
47	1.205E+00	-3.614E+00	1.579E-03	-2.160E-03	-2.132E-04	no	no	no	
46	6.264E-01	-3.758E+00	1.568E-03	-2.070E-03	-9.266E-05	no	no	no	
45	0.000E+00	-3.810E+00	1.579E-03	-2.063E-03	5.219E-05	no	no	no	
44	-6.264E-01	-3.758E+00	1.586E-03	-2.132E-03	1.891E-04	no	no	no	
43	-1.205E+00	-3.614E+00	1.567E-03	-2.274E-03	2.826E-04	no	no	no	
42	-1.704E+00	-3.408E+00	1.519E-03	-2.438E-03	3.468E-04	no	no	no	
41	-2.053E+00	-3.209E+00	1.461E-03	-2.572E-03	0.000E+00	no	no	no	
40	-2.380E+00	-2.975E+00	1.461E-03	-2.762E-03	3.450E-04	no	no	no	
39	-2.694E+00	-2.694E+00	1.461E-03	-2.943E-03	3.302E-04	no	no	no	
38	-2.975E+00	-2.380E+00	1.464E-03	-3.165E-03	3.326E-04	no	no	no	
37	-3.209E+00	-2.053E+00	1.476E-03	-3.403E-03	3.397E-04	no	no	no	
36	-3.408E+00	-1.704E+00	1.470E-03	-3.674E-03	2.994E-04	no	no	no	
35	-3.614E+00	-1.205E+00	1.496E-03	-4.031E-03	1.628E-04	no	no	no	
34	-3.758E+00	-6.264E-01	1.519E-03	-4.476E-03	1.178E-04	no	no	no	
33	-3.810E+00	0.000E+00	1.521E-03	-4.981E-03	-9.893E-06	no	no	no	
32	-3.758E+00	6.264E-01	1.534E-03	-5.475E-03	-1.453E-04	no	no	no	
31	-3.614E+00	1.205E+00	1.528E-03	-5.912E-03	-1.727E-04	no	no	no	
30	-3.408E+00	1.704E+00	1.518E-03	-6.249E-03	-3.339E-04	no	no	no	
29	-3.209E+00	2.053E+00	1.549E-03	-6.521E-03	-4.093E-04	no	no	no	
28	-2.975E+00	2.380E+00	1.563E-03	-6.754E-03	-3.432E-04	no	no	no	
27	-2.694E+00	2.694E+00	1.569E-03	-6.954E-03	-2.982E-04	no	no	no	
26	-2.380E+00	2.975E+00	1.587E-03	-7.100E-03	-2.939E-04	no	no	no	
25	-2.053E+00	3.209E+00	1.606E-03	-7.236E-03	-3.105E-04	no	no	no	
24	-1.704E+00	3.408E+00	1.638E-03	-7.345E-03	-2.352E-04	no	no	no	
23	-1.205E+00	3.614E+00	1.653E-03	-7.459E-03	-2.138E-04	no	no	no	
22	-6.264E-01	3.758E+00	1.677E-03	-7.602E-03	-2.484E-04	no	no	no	
21	0.000E+00	3.810E+00	1.679E-03	-7.679E-03	4.575E-05	no	no	no	
20	6.264E-01	3.758E+00	1.680E-03	-7.545E-03	3.464E-04	no	no	no	
19	1.205E+00	3.614E+00	1.704E-03	-7.337E-03	3.236E-04	no	no	no	
18	1.704E+00	3.408E+00	1.713E-03	-7.176E-03	2.622E-04	no	no	no	
17	2.053E+00	3.209E+00	1.723E-03	-7.049E-03	3.279E-04	no	no	no	
16	2.380E+00	2.975E+00	1.729E-03	-6.883E-03	3.094E-04	no	no	no	
15	2.694E+00	2.694E+00	1.721E-03	-6.725E-03	2.763E-04	no	no	no	
14	2.975E+00	2.380E+00	1.707E-03	-6.519E-03	3.043E-04	no	no	no	
13	3.209E+00	2.053E+00	1.703E-03	-6.276E-03	4.536E-04	no	no	no	
12	3.408E+00	1.704E+00	1.726E-03	-5.985E-03	3.784E-04	no	no	no	
11	3.614E+00	1.205E+00	1.711E-03	-5.637E-03	2.462E-04	no	no	no	
10	3.758E+00	6.264E-01	1.693E-03	-5.195E-03	9.286E-05	no	no	no	
9	3.810E+00	0.000E+00	1.682E-03	-4.701E-03	-1.470E-05	no	no	no	
8	3.758E+00	-6.264E-01	1.670E-03	-4.204E-03	-1.412E-04	no	no	no	
7	3.614E+00	-1.205E+00	1.677E-03	-3.765E-03	-1.802E-04	no	no	no	
6	3.408E+00	-1.704E+00	1.690E-03	-3.423E-03	-3.118E-04	no	no	no	
5	3.209E+00	-2.053E+00	1.671E-03	-3.162E-03	-3.516E-04	no	no	no	
4	2.975E+00	-2.380E+00	1.674E-03	-2.939E-03	-3.190E-04	no	no	no	
3	2.694E+00	-2.694E+00	1.674E-03	-2.734E-03	-2.984E-04	no	no	no	
2	2.380E+00	-2.975E+00	1.673E-03	-2.573E-03	-3.067E-04	no	no	no	
1	2.053E+00	-3.209E+00	1.670E-03	-2.409E-03	0.000E+00	no	no	no	
Node	X-load	Y-load	Moment	i	j	Pin	Sh. force	Angle	Bond
48	0.000E+00	0.000E+00	0.000E+00	39	30	no			
47	0.000E+00	0.000E+00	0.000E+00	38	30	no			
46	0.000E+00	0.000E+00	0.000E+00	37	30	no			
45	0.000E+00	0.000E+00	0.000E+00	36	30	no			

44	0.000E+00	0.000E+00	0.000E+00	35	30	no
43	0.000E+00	0.000E+00	0.000E+00	34	30	no
42	0.000E+00	0.000E+00	0.000E+00	33	30	no
41	0.000E+00	-9.099E+01	0.000E+00	33	31	yes
40	0.000E+00	-1.381E+03	0.000E+00	32	31	no
39	0.000E+00	-2.993E+03	0.000E+00	32	32	no
38	0.000E+00	-2.988E+03	0.000E+00	31	32	no
37	0.000E+00	-1.819E+02	0.000E+00	31	33	no
36	0.000E+00	-2.131E+02	0.000E+00	30	33	no
35	0.000E+00	-2.571E+02	0.000E+00	30	34	no
34	0.000E+00	-2.771E+02	0.000E+00	30	35	no
33	0.000E+00	-2.845E+02	0.000E+00	30	36	no
32	0.000E+00	-2.771E+02	0.000E+00	30	37	no
31	0.000E+00	-2.571E+02	0.000E+00	30	38	no
30	0.000E+00	-2.131E+02	0.000E+00	30	39	no
29	0.000E+00	-1.819E+02	0.000E+00	31	39	no
28	0.000E+00	-1.863E+02	0.000E+00	31	40	no
27	0.000E+00	-1.907E+02	0.000E+00	32	40	no
26	0.000E+00	-1.863E+02	0.000E+00	32	41	no
25	0.000E+00	-5.413E+03	0.000E+00	33	41	no
24	0.000E+00	-2.131E+02	0.000E+00	33	42	no
23	0.000E+00	-2.571E+02	0.000E+00	34	42	no
22	0.000E+00	-2.771E+02	0.000E+00	35	42	no
21	0.000E+00	-1.052E+04	0.000E+00	36	42	no
20	0.000E+00	-2.771E+02	0.000E+00	37	42	no
19	0.000E+00	-2.571E+02	0.000E+00	38	42	no
18	0.000E+00	-2.131E+02	0.000E+00	39	42	no
17	0.000E+00	-5.413E+03	0.000E+00	39	41	no
16	0.000E+00	-1.863E+02	0.000E+00	40	41	no
15	0.000E+00	-1.907E+02	0.000E+00	40	40	no
14	0.000E+00	-1.863E+02	0.000E+00	41	40	no
13	0.000E+00	-1.518E+04	9.085E+03	41	39	no
12	0.000E+00	-1.521E+04	9.085E+03	42	39	no
11	0.000E+00	-1.525E+04	9.085E+03	42	38	no
10	0.000E+00	-2.771E+02	0.000E+00	42	37	no
9	0.000E+00	-2.845E+02	0.000E+00	42	36	no
8	0.000E+00	-2.771E+02	0.000E+00	42	35	no
7	0.000E+00	-2.571E+02	0.000E+00	42	34	no
6	0.000E+00	-2.131E+02	0.000E+00	42	33	no
5	0.000E+00	-1.819E+02	0.000E+00	41	33	no
4	0.000E+00	-1.863E+02	0.000E+00	41	32	no
3	0.000E+00	-1.907E+02	0.000E+00	40	32	no
2	0.000E+00	-1.863E+02	0.000E+00	40	31	no
1	0.000E+00	-9.099E+01	0.000E+00	39	31	yes

Structural element data ...

Elem	ID	Nod1	Nod2	Prop		F-shear	F-axial	Mom-1	Mom-2
48	1	48	1	3	beam	1.809E+04	2.272E+05	7.269E+03	-7.848E-04
47	1	47	48	3	beam	7.143E+03	2.314E+05	1.141E+04	-7.551E+03
46	1	46	47	3	beam	3.216E+03	1.493E+05	1.417E+04	-1.225E+04
45	1	45	46	3	beam	3.323E+03	1.541E+05	1.604E+04	-1.396E+04
44	1	44	45	3	beam	-4.808E+03	1.768E+05	1.265E+04	-1.567E+04
43	1	43	44	3	beam	-8.403E+03	2.201E+05	7.700E+03	-1.271E+04
42	1	42	43	3	beam	-1.098E+03	3.095E+05	7.480E+03	-8.073E+03
41	1	41	42	3	beam	-1.776E+04	3.082E+05	1.119E-04	-7.139E+03
40	2	40	41	2	beam	-5.996E+03	2.688E+05	-2.410E+03	-1.524E-04
39	2	39	40	2	beam	1.044E+04	2.827E+05	1.936E+03	2.465E+03
38	2	38	39	2	beam	-9.304E+03	3.816E+05	-1.917E+03	-2.003E+03
37	2	37	38	2	beam	1.026E+04	4.851E+05	2.196E+03	1.928E+03
36	2	36	37	2	beam	-1.440E+04	5.577E+05	-3.650E+03	-2.139E+03

35	2	35	36	2	beam	6.202E+03	6.099E+05	-2.223E+02	3.573E+03
34	2	34	35	2	beam	-1.174E+03	7.132E+05	-9.163E+02	2.167E+02
33	2	33	34	2	beam	-1.870E+03	7.761E+05	-2.113E+03	9.377E+02
32	2	32	33	2	beam	1.626E+03	7.586E+05	-1.106E+03	2.128E+03
31	2	31	32	2	beam	2.501E+03	6.928E+05	3.987E+02	1.092E+03
30	2	30	31	2	beam	-9.900E+03	5.649E+05	-4.912E+03	-4.360E+02
29	2	29	30	2	beam	1.777E+04	5.357E+05	2.159E+03	4.983E+03
28	2	28	29	2	beam	-4.405E+03	4.393E+05	3.546E+02	-2.125E+03
27	2	27	28	2	beam	2.629E+03	3.324E+05	1.355E+03	-2.468E+02
26	2	26	27	2	beam	-5.559E+03	1.955E+05	-1.102E+03	-1.241E+03
25	2	25	26	2	beam	3.339E+03	1.588E+05	3.622E+02	9.799E+02
24	2	24	25	2	beam	5.143E+03	6.551E+04	2.447E+03	-3.796E+02
23	2	23	24	2	beam	-7.343E+03	4.819E+04	-1.686E+03	-2.280E+03
22	2	22	23	2	beam	4.068E+03	1.904E+04	7.730E+02	1.652E+03
21	2	21	22	2	beam	8.501E+03	8.056E+03	6.179E+03	-8.362E+02
20	2	20	21	2	beam	-8.201E+03	1.750E+04	1.019E+03	-6.173E+03
19	2	19	20	2	beam	-4.311E+03	4.508E+04	-1.561E+03	-1.008E+03
18	2	18	19	2	beam	2.710E+03	9.596E+04	-1.248E+02	1.588E+03
17	2	17	18	2	beam	7.151E+03	1.271E+05	2.659E+03	2.149E+02
16	2	16	17	2	beam	-1.487E+04	2.226E+05	-3.339E+03	-2.638E+03
15	2	15	16	2	beam	1.297E+04	2.521E+05	2.140E+03	3.324E+03
14	2	14	15	2	beam	-7.851E+03	3.783E+05	-1.152E+03	-2.156E+03
13	2	13	14	2	beam	1.937E+04	4.879E+05	6.688E+03	1.098E+03
12	2	12	13	2	beam	4.946E+03	5.821E+05	-4.131E+02	2.401E+03
11	2	11	12	2	beam	2.847E+04	5.875E+05	5.854E+03	9.528E+03
10	2	10	11	2	beam	4.623E+03	7.060E+05	-5.523E+02	3.308E+03
9	2	9	10	2	beam	-2.120E+03	7.603E+05	-1.956E+03	6.237E+02
8	2	8	9	2	beam	1.311E+03	7.636E+05	-1.094E+03	1.918E+03
7	2	7	8	2	beam	2.036E+03	6.962E+05	1.120E+02	1.101E+03
6	2	6	7	2	beam	-7.187E+03	5.792E+05	-3.772E+03	-1.107E+02
5	2	5	6	2	beam	1.497E+04	5.193E+05	2.271E+03	3.747E+03
4	2	4	5	2	beam	-8.096E+03	4.425E+05	-1.020E+03	-2.234E+03
3	2	3	4	2	beam	6.783E+03	3.506E+05	1.792E+03	1.066E+03
2	2	2	3	2	beam	-9.694E+03	2.448E+05	-2.187E+03	-1.898E+03
1	2	1	2	2	beam	5.482E+03	2.344E+05	1.652E-04	2.203E+03

Structural Properties ...

Prop Num.	Area	E	I	Dynamic Density	Plastic Moment
3	3.04800E-01	2.75800E+10	2.36000E-03	0.00000E+00	Not Set
2	5.90000E-03	1.64000E+11	4.57800E-05	0.00000E+00	Not Set
Prop. Cable Bond Num.	Cable Bond Stiffness	Cable Bond Strength	Yield Strength	Compressive Yield	Support Stiffness
3	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
2	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

>set log off

* log-file recording stopped 9-Aug-95 14:12

* FLAC log-file opened 9-Aug-95 14:17

From File : pl8k2dy.sav

stru

Structural node data ...

Node	X	Y	X-disp	Y-disp	Ang-disp	Xfix	Yfix	Rfix
48	1.704E+00	-3.408E+00	1.620E-03	-2.294E-03	-2.920E-04	no	no	no

Title: ESF Ground Support - Structural Steel Analysis

STATION: TSW2 @ 34+00

LOADING: SEISMIC + DL+UTIL

STEEL SET: W8X31 @ 2'-0" O.C.

• FLAC log-file opened 11-Aug-95 0:34

From File :

>res p34k2dyx.sav

following state has been restored:

date	time	step	grid	version
10-Aug-95	15:10	8218	70 X 70	3.22

Title:

>pr stru

Structural node data ...

Node	X	Y	X-disp	Y-disp	Ang-disp	Xfix	Yfix	Rfix
48	1.704E+00	-3.408E+00	1.806E-03	-2.554E-03	-5.189E-04	no	no	no
47	1.205E+00	-3.614E+00	1.712E-03	-2.316E-03	-4.219E-04	no	no	no
46	6.264E-01	-3.758E+00	1.634E-03	-2.112E-03	-3.067E-04	no	no	no
45	0.000E+00	-3.810E+00	1.582E-03	-2.017E-03	-5.976E-06	no	no	no
44	-6.264E-01	-3.758E+00	1.533E-03	-2.118E-03	3.218E-04	no	no	no
43	-1.205E+00	-3.614E+00	1.449E-03	-2.332E-03	4.691E-04	no	no	no
42	-1.704E+00	-3.408E+00	1.349E-03	-2.595E-03	5.465E-04	no	no	no
41	-2.053E+00	-3.209E+00	1.247E-03	-2.799E-03	0.000E+00	no	no	no
40	-2.380E+00	-2.975E+00	1.171E-03	-3.047E-03	6.014E-04	no	no	no
39	-2.694E+00	-2.694E+00	1.082E-03	-3.308E-03	6.042E-04	no	no	no
38	-2.975E+00	-2.380E+00	9.950E-04	-3.582E-03	5.551E-04	no	no	no
37	-3.209E+00	-2.053E+00	9.172E-04	-3.839E-03	5.478E-04	no	no	no
36	-3.408E+00	-1.704E+00	8.311E-04	-4.136E-03	5.009E-04	no	no	no
35	-3.614E+00	-1.205E+00	7.564E-04	-4.499E-03	3.147E-04	no	no	no
34	-3.758E+00	-6.264E-01	7.045E-04	-4.930E-03	1.837E-04	no	no	no
33	-3.810E+00	0.000E+00	6.867E-04	-5.397E-03	3.353E-06	no	no	no
32	-3.758E+00	6.264E-01	7.020E-04	-5.867E-03	-1.815E-04	no	no	no
31	-3.614E+00	1.205E+00	7.543E-04	-6.297E-03	-3.247E-04	no	no	no
30	-3.408E+00	1.704E+00	8.338E-04	-6.665E-03	-5.034E-04	no	no	no
29	-3.209E+00	2.053E+00	9.182E-04	-6.959E-03	-5.377E-04	no	no	no
28	-2.975E+00	2.380E+00	9.990E-04	-7.211E-03	-5.663E-04	no	no	no
27	-2.694E+00	2.694E+00	1.087E-03	-7.495E-03	-6.117E-04	no	no	no
26	-2.380E+00	2.975E+00	1.179E-03	-7.744E-03	-5.813E-04	no	no	no
25	-2.053E+00	3.209E+00	1.255E-03	-7.985E-03	-5.735E-04	no	no	no
24	-1.704E+00	3.408E+00	1.335E-03	-8.190E-03	-5.258E-04	no	no	no
23	-1.205E+00	3.614E+00	1.428E-03	-8.444E-03	-5.112E-04	no	no	no
22	-6.264E-01	3.758E+00	1.532E-03	-8.700E-03	-3.749E-04	no	no	no
21	0.000E+00	3.810E+00	1.644E-03	-8.819E-03	9.925E-06	no	no	no
20	6.264E-01	3.758E+00	1.753E-03	-8.684E-03	4.169E-04	no	no	no
19	1.205E+00	3.614E+00	1.852E-03	-8.400E-03	5.456E-04	no	no	no
18	1.704E+00	3.408E+00	1.936E-03	-8.126E-03	5.323E-04	no	no	no
17	2.053E+00	3.209E+00	2.011E-03	-7.911E-03	5.870E-04	no	no	no
16	2.380E+00	2.975E+00	2.081E-03	-7.667E-03	5.979E-04	no	no	no
15	2.694E+00	2.694E+00	2.163E-03	-7.405E-03	6.054E-04	no	no	no
14	2.975E+00	2.380E+00	2.238E-03	-7.115E-03	5.448E-04	no	no	no
13	3.209E+00	2.053E+00	2.309E-03	-6.856E-03	5.721E-04	no	no	no
12	3.408E+00	1.704E+00	2.390E-03	-6.549E-03	5.180E-04	no	no	no
11	3.614E+00	1.205E+00	2.460E-03	-6.179E-03	3.398E-04	no	no	no
10	3.758E+00	6.264E-01	2.494E-03	-5.753E-03	1.371E-04	no	no	no
9	3.810E+00	0.000E+00	2.494E-03	-5.292E-03	-1.553E-05	no	no	no
8	3.758E+00	-6.264E-01	2.469E-03	-4.835E-03	-1.920E-04	no	no	no
7	3.614E+00	-1.205E+00	2.413E-03	-4.411E-03	-3.156E-04	no	no	no
6	3.408E+00	-1.704E+00	2.337E-03	-4.058E-03	-4.879E-04	no	no	no
5	3.209E+00	-2.053E+00	2.247E-03	-3.766E-03	-5.592E-04	no	no	no
4	2.975E+00	-2.380E+00	2.164E-03	-3.513E-03	-5.549E-04	no	no	no
3	2.694E+00	-2.694E+00	2.078E-03	-3.248E-03	-5.797E-04	no	no	no
2	2.380E+00	-2.975E+00	1.986E-03	-3.001E-03	-5.982E-04	no	no	no

Node	X-load	Y-load	Moment	i	j	Pin	Sh. force	Angle	Bond
1	2.053E+00	-3.209E+00	1.907E-03	-2.749E-03	0.000E+00	no	no	no	
48	0.000E+00	0.000E+00	0.000E+00	39	30	no			
47	0.000E+00	0.000E+00	0.000E+00	38	30	no			
46	0.000E+00	0.000E+00	0.000E+00	37	30	no			
45	0.000E+00	0.000E+00	0.000E+00	36	30	no			
44	0.000E+00	0.000E+00	0.000E+00	35	30	no			
43	0.000E+00	0.000E+00	0.000E+00	34	30	no			
42	0.000E+00	0.000E+00	0.000E+00	33	30	no			
41	0.000E+00	-9.099E+01	0.000E+00	33	31	yes			
40	0.000E+00	-1.381E+03	0.000E+00	32	31	no			
39	0.000E+00	-2.993E+03	0.000E+00	32	32	no			
38	0.000E+00	-2.988E+03	0.000E+00	31	32	no			
37	0.000E+00	-1.819E+02	0.000E+00	31	33	no			
36	0.000E+00	-2.131E+02	0.000E+00	30	33	no			
35	0.000E+00	-2.571E+02	0.000E+00	30	34	no			
34	0.000E+00	-2.771E+02	0.000E+00	30	35	no			
33	0.000E+00	-2.845E+02	0.000E+00	30	36	no			
32	0.000E+00	-2.771E+02	0.000E+00	30	37	no			
31	0.000E+00	-2.571E+02	0.000E+00	30	38	no			
30	0.000E+00	-2.131E+02	0.000E+00	30	39	no			
29	0.000E+00	-1.819E+02	0.000E+00	31	39	no			
28	0.000E+00	-1.863E+02	0.000E+00	31	40	no			
27	0.000E+00	-1.907E+02	0.000E+00	32	40	no			
26	0.000E+00	-1.863E+02	0.000E+00	32	41	no			
25	0.000E+00	-5.413E+03	0.000E+00	33	41	no			
24	0.000E+00	-2.131E+02	0.000E+00	33	42	no			
23	0.000E+00	-2.571E+02	0.000E+00	34	42	no			
22	0.000E+00	-2.771E+02	0.000E+00	35	42	no			
21	0.000E+00	-1.052E+04	0.000E+00	36	42	no			
20	0.000E+00	-2.771E+02	0.000E+00	37	42	no			
19	0.000E+00	-2.571E+02	0.000E+00	38	42	no			
18	0.000E+00	-2.131E+02	0.000E+00	39	42	no			
17	0.000E+00	-5.413E+03	0.000E+00	39	41	no			
16	0.000E+00	-1.863E+02	0.000E+00	40	41	no			
15	0.000E+00	-1.907E+02	0.000E+00	40	40	no			
14	0.000E+00	-1.863E+02	0.000E+00	41	40	no			
13	0.000E+00	-1.518E+04	9.085E+03	41	39	no			
12	0.000E+00	-1.521E+04	9.085E+03	42	39	no			
11	0.000E+00	-1.525E+04	9.085E+03	42	38	no			
10	0.000E+00	-2.771E+02	0.000E+00	42	37	no			
9	0.000E+00	-2.845E+02	0.000E+00	42	36	no			
8	0.000E+00	-2.771E+02	0.000E+00	42	35	no			
7	0.000E+00	-2.571E+02	0.000E+00	42	34	no			
6	0.000E+00	-2.131E+02	0.000E+00	42	33	no			
5	0.000E+00	-1.819E+02	0.000E+00	41	33	no			
4	0.000E+00	-1.863E+02	0.000E+00	41	32	no			
3	0.000E+00	-1.907E+02	0.000E+00	40	32	no			
2	0.000E+00	-1.863E+02	0.000E+00	40	31	no			
1	0.000E+00	-9.099E+01	0.000E+00	39	31	yes			

Structural element data ...

Elem	ID	Nod1	Nod2	Prop		F-shear	F-axial	Mom-1	Mom-2
48	1	48	1	3	beam	4.106E+04	2.219E+05	1.650E+04	5.261E-04
47	1	47	48	3	beam	-1.887E+04	2.905E+04	6.640E+03	-1.683E+04
46	1	46	47	3	beam	1.935E+04	-3.223E+05	1.838E+04	-6.844E+03
45	1	45	46	3	beam	4.075E+04	-5.881E+05	4.394E+04	-1.832E+04
44	1	44	45	3	beam	-3.089E+04	-5.958E+05	2.421E+04	-4.363E+04
43	1	43	44	3	beam	-2.820E+04	-3.101E+05	7.691E+03	-2.450E+04
42	1	42	43	3	beam	5.901E+03	6.768E+04	1.091E+04	-7.725E+03

41	1	41	42	3	beam	-2.736E+04	2.459E+05	2.122E-07	-1.100E+04
40	2	40	41	2	beam	-3.537E+03	4.062E+05	-1.422E+03	-8.372E-05
39	2	39	40	2	beam	7.992E+03	4.743E+05	1.777E+03	1.591E+03
38	2	38	39	2	beam	-1.588E+04	6.949E+05	-5.093E+03	-1.600E+03
37	2	37	38	2	beam	2.351E+04	7.896E+05	4.448E+03	5.000E+03
36	2	36	37	2	beam	-3.135E+04	1.027E+06	-8.042E+03	-4.557E+03
35	2	35	36	2	beam	1.141E+04	1.110E+06	-2.088E+03	8.249E+03
34	2	34	35	2	beam	-3.750E+03	1.317E+06	-4.426E+03	2.191E+03
33	2	33	34	2	beam	4.248E+02	1.437E+06	-4.179E+03	4.446E+03
32	2	32	33	2	beam	-7.024E+02	1.446E+06	-4.630E+03	4.189E+03
31	2	31	32	2	beam	2.995E+03	1.311E+06	-2.709E+03	4.494E+03
30	2	30	31	2	beam	-8.295E+03	1.125E+06	-7.202E+03	2.721E+03
29	2	29	30	2	beam	2.950E+04	1.033E+06	4.653E+03	7.202E+03
28	2	28	29	2	beam	-2.772E+04	7.550E+05	-6.655E+03	-4.488E+03
27	2	27	28	2	beam	2.423E+04	7.060E+05	3.482E+03	6.727E+03
26	2	26	27	2	beam	-1.119E+04	4.579E+05	-1.281E+03	-3.434E+03
25	2	25	26	2	beam	8.441E+03	3.686E+05	2.005E+03	1.388E+03
24	2	24	25	2	beam	-1.313E+03	1.531E+05	1.511E+03	-2.039E+03
23	2	23	24	2	beam	-4.978E+03	4.384E+04	-9.515E+02	-1.737E+03
22	2	22	23	2	beam	1.459E+04	-1.227E+05	7.797E+03	8.971E+02
21	2	21	22	2	beam	4.819E+03	-3.122E+05	1.071E+04	-7.683E+03
20	2	20	21	2	beam	-2.750E+03	-3.057E+05	8.846E+03	-1.057E+04
19	2	19	20	2	beam	-1.897E+04	-7.934E+04	-2.415E+03	-8.893E+03
18	2	18	19	2	beam	7.572E+03	1.010E+05	1.677E+03	2.413E+03
17	2	17	18	2	beam	1.591E+03	1.874E+05	2.350E+03	-1.711E+03
16	2	16	17	2	beam	-1.078E+04	4.235E+05	-1.762E+03	-2.570E+03
15	2	15	16	2	beam	9.068E+03	5.272E+05	2.179E+03	1.642E+03
14	2	14	15	2	beam	-2.042E+04	7.649E+05	-6.456E+03	-2.149E+03
13	2	13	14	2	beam	3.731E+04	8.182E+05	8.533E+03	6.463E+03
12	2	12	13	2	beam	-6.273E+03	1.082E+06	-3.294E+03	7.722E+02
11	2	11	12	2	beam	2.710E+04	1.137E+06	2.363E+03	1.227E+04
10	2	10	11	2	beam	5.223E+03	1.317E+06	-3.540E+03	6.653E+03
9	2	9	10	2	beam	-4.550E+01	1.420E+06	-3.661E+03	3.632E+03
8	2	8	9	2	beam	-1.746E+03	1.404E+06	-4.767E+03	3.670E+03
7	2	7	8	2	beam	5.207E+03	1.294E+06	-1.556E+03	4.660E+03
6	2	6	7	2	beam	-1.184E+04	1.075E+06	-7.978E+03	1.581E+03
5	2	5	6	2	beam	2.797E+04	1.004E+06	2.945E+03	8.300E+03
4	2	4	5	2	beam	-1.379E+04	7.548E+05	-2.612E+03	-2.932E+03
3	2	3	4	2	beam	7.540E+03	6.494E+05	6.999E+02	2.477E+03
2	2	2	3	2	beam	-6.711E+03	4.458E+05	-2.064E+03	-7.635E+02
1	2	1	2	2	beam	5.026E+03	3.794E+05	1.074E-04	2.020E+03

Structural Properties ...

Prop Num.	Area	E	I	Dynamic Density	Plastic Moment
3	3.04800E-01	2.75800E+10	2.36000E-03	0.00000E+00	Not Set
2	5.90000E-03	3.27870E+11	4.57800E-05	0.00000E+00	Not Set
Prop. Num.	Cable Bond Stiffness	Cable Bond Strength	Yield Strength	Compressive Yield	Support Stiffness
3	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
2	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

set log off

log-file recording stopped 11-Aug-95 0:34

Title: ESF Ground Support - Structural Steel Analysis

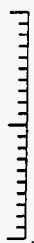
JOB TITLE : Structural Node ID

FLAC (Version 3.22)

LEGEND

8/10/1995 08:34
step 5218
-5.000E+00 <x< 5.000E+00
-5.000E+00 <y< 5.000E+00

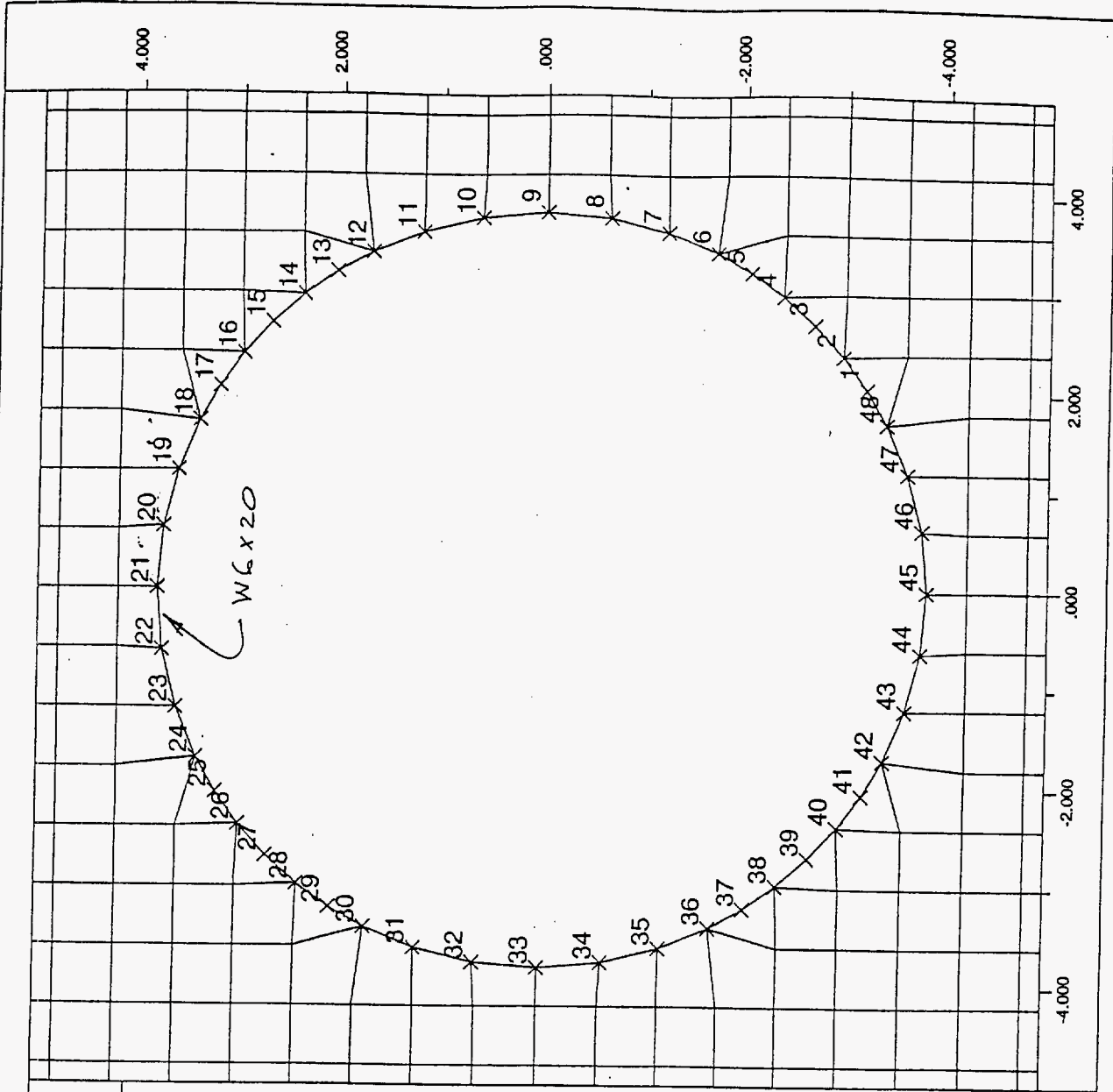
Grid plot



0 2E 0

Structural Node Numbers

CRWMS M & O



STATION: TCW @ 7+00

* FLAC log-file opened 10-Aug-95 12:09

Seismic Model @07+00: Ctg-3, Ko=0.25, W6x20 Steel Set

LOADING: SEISMIC + DL+UTII

From File : m07_k2dy.sav

STEEL SET: W6X20 @ 4'-0" O.C

>pr stru

Structural node data ...

Node	X	Y	X-disp	Y-disp	Ang-disp	Xfix	Yfix	Rfix	
48	1.704E+00	-3.408E+00	9.613E-04	-6.995E-03	-1.010E-04	no	no	no	
47	1.205E+00	-3.614E+00	9.417E-04	-6.951E-03	-8.028E-05	no	no	no	
46	6.264E-01	-3.758E+00	9.231E-04	-6.910E-03	-5.913E-05	no	no	no	
45	0.000E+00	-3.810E+00	9.055E-04	-6.893E-03	-1.576E-06	no	no	no	
44	-6.264E-01	-3.758E+00	8.869E-04	-6.910E-03	6.338E-05	no	no	no	
43	-1.205E+00	-3.614E+00	8.654E-04	-6.957E-03	1.022E-04	no	no	no	
42	-1.704E+00	-3.408E+00	8.407E-04	-7.014E-03	1.259E-04	no	no	no	
41	-2.053E+00	-3.209E+00	8.159E-04	-7.060E-03	0.000E+00	no	no	no	
40	-2.380E+00	-2.975E+00	8.010E-04	-7.116E-03	1.373E-04	no	no	no	
39	-2.694E+00	-2.694E+00	7.786E-04	-7.176E-03	1.450E-04	no	no	no	
38	-2.975E+00	-2.380E+00	7.627E-04	-7.248E-03	1.298E-04	no	no	no	
37	-3.209E+00	-2.053E+00	7.471E-04	-7.310E-03	1.281E-04	no	no	no	
36	-3.408E+00	-1.704E+00	7.311E-04	-7.387E-03	1.191E-04	no	no	no	
35	-3.614E+00	-1.205E+00	7.174E-04	-7.486E-03	7.614E-05	no	no	no	
34	-3.758E+00	-6.264E-01	7.076E-04	-7.500E-03	4.468E-05	no	no	no	
33	-3.810E+00	0.000E+00	7.034E-04	-7.723E-03	1.033E-06	no	no	no	
32	-3.758E+00	6.264E-01	7.065E-04	-7.843E-03	-4.321E-05	no	no	no	
31	-3.614E+00	1.205E+00	7.158E-04	-7.953E-03	-6.896E-05	no	no	no	
30	-3.408E+00	1.704E+00	7.260E-04	-8.043E-03	-1.054E-04	no	no	no	
29	-3.209E+00	2.053E+00	7.405E-04	-8.115E-03	-1.212E-04	no	no	no	
28	-2.975E+00	2.380E+00	7.558E-04	-8.175E-03	-1.217E-04	no	no	no	
27	-2.694E+00	2.694E+00	7.695E-04	-8.238E-03	-1.232E-04	no	no	no	
26	-2.380E+00	2.975E+00	7.878E-04	-8.289E-03	-1.197E-04	no	no	no	
25	-2.053E+00	3.209E+00	8.003E-04	-8.341E-03	-1.193E-04	no	no	no	
24	-1.704E+00	3.408E+00	8.188E-04	-8.382E-03	-1.068E-04	no	no	no	
23	-1.205E+00	3.614E+00	8.383E-04	-8.431E-03	-8.973E-05	no	no	no	
22	-6.264E-01	3.758E+00	8.644E-04	-8.470E-03	-5.858E-05	no	no	no	
21	0.000E+00	3.810E+00	8.949E-04	-8.485E-03	7.502E-06	no	no	no	
20	6.264E-01	3.758E+00	9.252E-04	-8.460E-03	7.443E-05	no	no	no	
19	1.205E+00	3.614E+00	9.504E-04	-8.411E-03	1.059E-04	no	no	no	
18	1.704E+00	3.408E+00	9.687E-04	-8.353E-03	1.198E-04	no	no	no	
17	2.053E+00	3.209E+00	9.853E-04	-8.305E-03	1.281E-04	no	no	no	
16	2.380E+00	2.975E+00	9.960E-04	-8.249E-03	1.239E-04	no	no	no	
15	2.694E+00	2.694E+00	1.012E-03	-8.191E-03	1.410E-04	no	no	no	
14	2.975E+00	2.380E+00	1.023E-03	-8.123E-03	7.989E-05	no	no	no	
13	3.209E+00	2.053E+00	1.036E-03	-8.062E-03	2.683E-04	no	no	no	
12	3.408E+00	1.704E+00	1.050E-03	-7.987E-03	2.062E-04	no	no	no	
11	3.614E+00	1.205E+00	1.061E-03	-7.893E-03	2.868E-04	no	no	no	
10	3.758E+00	6.264E-01	1.070E-03	-7.782E-03	-1.664E-05	no	no	no	
9	3.810E+00	0.000E+00	1.072E-03	-7.662E-03	1.586E-05	no	no	no	
8	3.758E+00	-6.264E-01	1.070E-03	-7.541E-03	-4.601E-05	no	no	no	
7	3.614E+00	-1.205E+00	1.062E-03	-7.429E-03	-6.708E-05	no	no	no	
6	3.408E+00	-1.704E+00	1.052E-03	-7.335E-03	-1.092E-04	no	no	no	
5	3.209E+00	-2.053E+00	1.039E-03	-7.262E-03	-1.170E-04	no	no	no	
4	2.975E+00	-2.380E+00	1.026E-03	-7.204E-03	-1.163E-04	no	no	no	
3	2.694E+00	-2.694E+00	1.013E-03	-7.137E-03	-1.309E-04	no	no	no	
2	2.380E+00	-2.975E+00	9.936E-04	-7.084E-03	-1.222E-04	no	no	no	
1	2.053E+00	-3.209E+00	9.820E-04	-7.033E-03	0.000E+00	no	no	no	
Node	X-load	Y-load	Moment	i	j	Pin	Sh. force	Angle	Bond
48	0.000E+00	0.000E+00	0.000E+00	39	30	no			
47	0.000E+00	0.000E+00	0.000E+00	38	30	no			
46	0.000E+00	0.000E+00	0.000E+00	37	30	no			
45	0.000E+00	0.000E+00	0.000E+00	36	30	no			

44	0.000E+00	0.000E+00	0.000E+00	35	30	no
43	0.000E+00	0.000E+00	0.000E+00	34	30	no
42	0.000E+00	0.000E+00	0.000E+00	33	30	no
41	0.000E+00	-5.870E+01	0.000E+00	33	31	yes
40	0.000E+00	-1.321E+03	0.000E+00	32	31	no
39	0.000E+00	-2.925E+03	0.000E+00	32	32	no
38	0.000E+00	-2.922E+03	0.000E+00	31	32	no
37	0.000E+00	-1.174E+02	0.000E+00	31	33	no
36	0.000E+00	-1.375E+02	0.000E+00	30	33	no
35	0.000E+00	-1.659E+02	0.000E+00	30	34	no
34	0.000E+00	-1.788E+02	0.000E+00	30	35	no
33	0.000E+00	-1.835E+02	0.000E+00	30	36	no
32	0.000E+00	-1.788E+02	0.000E+00	30	37	no
31	0.000E+00	-1.659E+02	0.000E+00	30	38	no
30	0.000E+00	-1.375E+02	0.000E+00	30	39	no
29	0.000E+00	-1.174E+02	0.000E+00	31	39	no
28	0.000E+00	-1.202E+02	0.000E+00	31	40	no
27	0.000E+00	-1.230E+02	0.000E+00	32	40	no
26	0.000E+00	-1.202E+02	0.000E+00	32	41	no
25	0.000E+00	-5.366E+03	0.000E+00	33	41	no
24	0.000E+00	-1.375E+02	0.000E+00	33	42	no
23	0.000E+00	-1.659E+02	0.000E+00	34	42	no
22	0.000E+00	-1.788E+02	0.000E+00	35	42	no
21	0.000E+00	-1.041E+04	0.000E+00	36	42	no
20	0.000E+00	-1.788E+02	0.000E+00	37	42	no
19	0.000E+00	-1.659E+02	0.000E+00	38	42	no
18	0.000E+00	-1.375E+02	0.000E+00	39	42	no
17	0.000E+00	-5.366E+03	0.000E+00	39	41	no
16	0.000E+00	-1.202E+02	0.000E+00	40	41	no
15	0.000E+00	-1.230E+02	0.000E+00	40	40	no
14	0.000E+00	-1.202E+02	0.000E+00	41	40	no
13	0.000E+00	-1.511E+04	9.085E+03	41	39	no
12	0.000E+00	-1.513E+04	9.085E+03	42	39	no
11	0.000E+00	-1.516E+04	9.085E+03	42	38	no
10	0.000E+00	-1.788E+02	0.000E+00	42	37	no
9	0.000E+00	-1.835E+02	0.000E+00	42	36	no
8	0.000E+00	-1.788E+02	0.000E+00	42	35	no
7	0.000E+00	-1.659E+02	0.000E+00	42	34	no
6	0.000E+00	-1.375E+02	0.000E+00	42	33	no
5	0.000E+00	-1.174E+02	0.000E+00	41	33	no
4	0.000E+00	-1.202E+02	0.000E+00	41	32	no
3	0.000E+00	-1.230E+02	0.000E+00	40	32	no
2	0.000E+00	-1.202E+02	0.000E+00	40	31	no
1	0.000E+00	-5.870E+01	0.000E+00	39	31	yes

Structural element data ...

Elem	ID	Nod1	Nod2	Prop		F-shear	F-axial	Mom-1	Mom-2
48	1	48	1	3	beam	9.245E+03	2.151E+04	3.716E+03	-2.881E-04
47	1	47	48	3	beam	-3.887E+03	-1.651E+04	1.443E+03	-3.542E+03
46	1	46	47	3	beam	2.837E+03	-1.234E+05	3.155E+03	-1.464E+03
45	1	45	46	3	beam	9.133E+03	-2.129E+05	8.828E+03	-3.088E+03
44	1	44	45	3	beam	-7.120E+03	-2.254E+05	4.504E+03	-8.979E+03
43	1	43	44	3	beam	-1.390E+03	-1.388E+05	3.821E+03	-4.649E+03
42	1	42	43	3	beam	-2.746E+03	-1.262E+04	2.101E+03	-3.584E+03
41	1	41	42	3	beam	-4.998E+03	2.083E+04	-4.564E-04	-2.009E+03
40	2	40	41	2	beam	1.162E+02	3.195E+04	4.672E+01	2.388E-05
39	2	39	40	2	beam	-1.815E+01	3.393E+04	4.781E+01	-5.546E+01
38	2	38	39	2	beam	-7.887E+02	6.347E+04	-2.679E+02	-6.442E+01
37	2	37	38	2	beam	1.220E+03	6.496E+04	2.335E+02	2.569E+02
36	2	36	37	2	beam	-1.424E+03	9.104E+04	-3.489E+02	-2.233E+02

35	2	35	36	2	beam	4.953E+02	9.929E+04	-9.082E+01	3.584E+02
34	2	34	35	2	beam	-1.677E+02	1.131E+05	-1.994E+02	9.946E+01
33	2	33	34	2	beam	1.793E+00	1.213E+05	-1.963E+02	1.974E+02
32	2	32	33	2	beam	-4.232E+01	1.183E+05	-2.116E+02	1.850E+02
31	2	31	32	2	beam	3.156E+02	1.084E+05	-2.778E+01	2.159E+02
30	2	30	31	2	beam	-5.650E+02	9.198E+04	-3.443E+02	3.910E+01
29	2	29	30	2	beam	1.073E+03	8.448E+04	1.054E+02	3.258E+02
28	2	28	29	2	beam	-5.206E+02	6.159E+04	-1.081E+02	-1.012E+02
27	2	27	28	2	beam	5.152E+02	5.633E+04	9.829E+01	1.188E+02
26	2	26	27	2	beam	-3.720E+02	3.058E+04	-5.306E+01	-1.037E+02
25	2	25	26	2	beam	3.318E+02	2.969E+04	6.780E+01	6.558E+01
24	2	24	25	2	beam	1.436E+02	7.402E+03	1.160E+02	-5.833E+01
23	2	23	24	2	beam	-1.358E+02	7.612E+02	5.271E+01	-1.261E+02
22	2	22	23	2	beam	2.718E+02	-1.574E+04	2.281E+02	-6.608E+01
21	2	21	22	2	beam	1.891E+02	-2.919E+04	3.579E+02	-2.390E+02
20	2	20	21	2	beam	-1.414E+02	-2.816E+04	2.568E+02	-3.457E+02
19	2	19	20	2	beam	-3.124E+02	-1.242E+04	5.497E+01	-2.412E+02
18	2	18	19	2	beam	4.295E+01	6.534E+03	8.461E+01	-6.141E+01
17	2	17	18	2	beam	-1.874E+02	1.416E+04	2.126E+01	-9.659E+01
16	2	16	17	2	beam	-2.972E+02	3.626E+04	-8.909E+01	-3.035E+01
15	2	15	16	2	beam	1.008E+03	3.966E+04	3.271E+02	9.757E+01
14	2	14	15	2	beam	-3.426E+03	6.366E+04	-1.132E+03	-3.113E+02
13	2	13	14	2	beam	1.217E+04	6.558E+04	3.771E+03	1.121E+03
12	2	12	13	2	beam	2.426E+04	8.984E+04	4.439E+03	5.311E+03
11	2	11	12	2	beam	1.877E+04	9.530E+04	5.490E+03	4.647E+03
10	2	10	11	2	beam	7.221E+03	1.107E+05	7.136E+02	3.590E+03
9	2	9	10	2	beam	-1.797E+03	1.186E+05	-4.185E+02	-7.107E+02
8	2	8	9	2	beam	4.710E+02	1.189E+05	-1.305E+02	4.266E+02
7	2	7	8	2	beam	9.385E+01	1.114E+05	-7.181E+01	1.278E+02
6	2	6	7	2	beam	-5.809E+02	9.599E+04	-3.779E+02	6.407E+01
5	2	5	6	2	beam	1.576E+03	8.739E+04	2.632E+02	3.705E+02
4	2	4	5	2	beam	-1.251E+03	6.219E+04	-2.464E+02	-2.566E+02
3	2	3	4	2	beam	7.421E+02	6.067E+04	5.804E+01	2.547E+02
2	2	2	3	2	beam	-1.758E+00	3.136E+04	5.797E+01	-5.871E+01
1	2	1	2	2	beam	-1.525E+02	3.071E+04	-9.769E-06	-6.130E+01

Structural Properties ...

Prop Num.	Area	E	I	Dynamic Density	Plastic Moment
3	3.04800E-01	2.75800E+10	2.36000E-03	0.00000E+00	Not Set
2	3.78700E-03	1.64000E+11	1.72300E-05	0.00000E+00	Not Set
Prop. Num.	Cable Bond Stiffness	Cable Bond Strength	Yield Strength	Compressive Yield	Support Stiffness
3	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
2	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

set log off

log-file recording stopped 10-Aug-95 12:09

FLAC log-file opened 10-Aug-95 12:22

Seismic Model @07+00: Ctg-3, Ko=0.25, W6x20 Steel Set

From File : m07_k2dy.sav

stru

Structural node data ...

Node	X	Y	X-disp	Y-disp	Ang-disp	Xfix	Yfix	Rfix
48	1.704E+00	-3.408E+00	9.613E-04	-6.995E-03	-1.010E-04	no	no	no

MCT
11-10-95

* FLAC log-file opened 10-Aug-95 12:22
 Seismic Model @18+00: Ctg-3, Ko=0.25, W6x20 Steel Set
 From File : ml8_k2dy.sav
 >pr stru

STATION: TSW1 @ 18+00

LOADING: SEISMIC + DL+UTIL

STEEL SET: W6X20 @ 4'-0" O.C.

structural node data ...

Node	X	Y	X-disp	Y-disp	Ang-disp	Xfix	Yfix	Rfix	
48	1.704E+00	-3.408E+00	7.685E-04	-1.136E-03	-1.164E-04	no	no	no	
47	1.205E+00	-3.614E+00	7.564E-04	-1.086E-03	-8.744E-05	no	no	no	
46	6.264E-01	-3.758E+00	7.475E-04	-1.037E-03	-6.602E-05	no	no	no	
45	0.000E+00	-3.810E+00	7.476E-04	-1.020E-03	1.716E-05	no	no	no	
44	-6.264E-01	-3.758E+00	7.475E-04	-1.056E-03	9.793E-05	no	no	no	
43	-1.205E+00	-3.614E+00	7.378E-04	-1.125E-03	1.151E-04	no	no	no	
42	-1.704E+00	-3.408E+00	7.231E-04	-1.189E-03	1.423E-04	no	no	no	
41	-2.053E+00	-3.209E+00	6.982E-04	-1.251E-03	0.000E+00	no	no	no	
40	-2.380E+00	-2.975E+00	6.984E-04	-1.333E-03	1.648E-04	no	no	no	
39	-2.694E+00	-2.694E+00	6.862E-04	-1.415E-03	1.746E-04	no	no	no	
38	-2.975E+00	-2.380E+00	6.742E-04	-1.509E-03	1.491E-04	no	no	no	
37	-3.209E+00	-2.053E+00	6.603E-04	-1.590E-03	1.790E-04	no	no	no	
36	-3.408E+00	-1.704E+00	6.422E-04	-1.717E-03	1.538E-04	no	no	no	
35	-3.614E+00	-1.205E+00	6.638E-04	-1.864E-03	2.666E-05	no	no	no	
34	-3.758E+00	-6.264E-01	7.025E-04	-2.082E-03	1.906E-05	no	no	no	
33	-3.810E+00	0.000E+00	7.208E-04	-2.362E-03	-4.517E-06	no	no	no	
32	-3.758E+00	6.264E-01	7.092E-04	-2.634E-03	-2.913E-05	no	no	no	
31	-3.614E+00	1.205E+00	6.815E-04	-2.834E-03	-3.729E-05	no	no	no	
30	-3.408E+00	1.704E+00	6.727E-04	-2.966E-03	-1.671E-04	no	no	no	
29	-3.209E+00	2.053E+00	6.953E-04	-3.091E-03	-1.743E-04	no	no	no	
28	-2.975E+00	2.380E+00	7.140E-04	-3.156E-03	-1.437E-04	no	no	no	
27	-2.694E+00	2.694E+00	7.248E-04	-3.253E-03	-1.682E-04	no	no	no	
26	-2.380E+00	2.975E+00	7.421E-04	-3.321E-03	-1.428E-04	no	no	no	
25	-2.053E+00	3.209E+00	7.509E-04	-3.387E-03	-1.449E-04	no	no	no	
24	-1.704E+00	3.408E+00	7.621E-04	-3.445E-03	-1.353E-04	no	no	no	
23	-1.205E+00	3.614E+00	7.724E-04	-3.514E-03	-1.011E-04	no	no	no	
22	-6.264E-01	3.758E+00	7.837E-04	-3.560E-03	-8.994E-05	no	no	no	
21	0.000E+00	3.810E+00	7.980E-04	-3.605E-03	5.750E-06	no	no	no	
20	6.264E-01	3.758E+00	8.115E-04	-3.548E-03	1.278E-04	no	no	no	
19	1.205E+00	3.614E+00	8.200E-04	-3.472E-03	1.349E-04	no	no	no	
18	1.704E+00	3.408E+00	8.248E-04	-3.389E-03	1.507E-04	no	no	no	
17	2.053E+00	3.209E+00	8.331E-04	-3.323E-03	1.642E-04	no	no	no	
16	2.380E+00	2.975E+00	8.373E-04	-3.246E-03	1.459E-04	no	no	no	
15	2.694E+00	2.694E+00	8.460E-04	-3.172E-03	1.740E-04	no	no	no	
14	2.975E+00	2.380E+00	8.469E-04	-3.067E-03	9.743E-05	no	no	no	
13	3.209E+00	2.053E+00	8.614E-04	-2.996E-03	3.284E-04	no	no	no	
12	3.408E+00	1.704E+00	8.805E-04	-2.859E-03	2.667E-04	no	no	no	
11	3.614E+00	1.205E+00	8.641E-04	-2.721E-03	2.407E-04	no	no	no	
10	3.758E+00	6.264E-01	8.287E-04	-2.517E-03	-4.453E-05	no	no	no	
9	3.810E+00	0.000E+00	8.058E-04	-2.243E-03	7.715E-06	no	no	no	
8	3.758E+00	-6.264E-01	8.184E-04	-1.968E-03	-3.301E-05	no	no	no	
7	3.614E+00	-1.205E+00	8.494E-04	-1.758E-03	-3.195E-05	no	no	no	
6	3.408E+00	-1.704E+00	8.646E-04	-1.619E-03	-1.599E-04	no	no	no	
5	3.209E+00	-2.053E+00	8.423E-04	-1.494E-03	-1.847E-04	no	no	no	
4	2.975E+00	-2.380E+00	8.227E-04	-1.420E-03	-1.548E-04	no	no	no	
3	2.694E+00	-2.694E+00	8.086E-04	-1.325E-03	-1.683E-04	no	no	no	
2	2.380E+00	-2.975E+00	7.954E-04	-1.253E-03	-1.407E-04	no	no	no	
1	2.053E+00	-3.209E+00	7.908E-04	-1.186E-03	0.000E+00	no	no	no	
Node	X-load	Y-load	Moment	i	j	Pin	Sh. force	Angle	Bond
48	0.000E+00	0.000E+00	0.000E+00	39	30	no			
47	0.000E+00	0.000E+00	0.000E+00	38	30	no			
46	0.000E+00	0.000E+00	0.000E+00	37	30	no			
45	0.000E+00	0.000E+00	0.000E+00	36	30	no			

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44	0.000E+00	0.000E+00	0.000E+00	35	30	no
43	0.000E+00	0.000E+00	0.000E+00	34	30	no
42	0.000E+00	0.000E+00	0.000E+00	33	30	no
41	0.000E+00	-5.870E+01	0.000E+00	33	31	yes
40	0.000E+00	-1.321E+03	0.000E+00	32	31	no
39	0.000E+00	-2.925E+03	0.000E+00	32	32	no
38	0.000E+00	-2.922E+03	0.000E+00	31	32	no
37	0.000E+00	-1.174E+02	0.000E+00	31	33	no
36	0.000E+00	-1.375E+02	0.000E+00	30	33	no
35	0.000E+00	-1.659E+02	0.000E+00	30	34	no
34	0.000E+00	-1.788E+02	0.000E+00	30	35	no
33	0.000E+00	-1.835E+02	0.000E+00	30	36	no
32	0.000E+00	-1.788E+02	0.000E+00	30	37	no
31	0.000E+00	-1.659E+02	0.000E+00	30	38	no
30	0.000E+00	-1.375E+02	0.000E+00	30	39	no
29	0.000E+00	-1.174E+02	0.000E+00	31	39	no
28	0.000E+00	-1.202E+02	0.000E+00	31	40	no
27	0.000E+00	-1.230E+02	0.000E+00	32	40	no
26	0.000E+00	-1.202E+02	0.000E+00	32	41	no
25	0.000E+00	-5.366E+03	0.000E+00	33	41	no
24	0.000E+00	-1.375E+02	0.000E+00	33	42	no
23	0.000E+00	-1.659E+02	0.000E+00	34	42	no
22	0.000E+00	-1.788E+02	0.000E+00	35	42	no
21	0.000E+00	-1.041E+04	0.000E+00	36	42	no
20	0.000E+00	-1.788E+02	0.000E+00	37	42	no
19	0.000E+00	-1.659E+02	0.000E+00	38	42	no
18	0.000E+00	-1.375E+02	0.000E+00	39	42	no
17	0.000E+00	-5.366E+03	0.000E+00	39	41	no
16	0.000E+00	-1.202E+02	0.000E+00	40	41	no
15	0.000E+00	-1.230E+02	0.000E+00	40	40	no
14	0.000E+00	-1.202E+02	0.000E+00	41	40	no
13	0.000E+00	-1.511E+04	9.085E+03	41	39	no
12	0.000E+00	-1.513E+04	9.085E+03	42	39	no
11	0.000E+00	-1.516E+04	9.085E+03	42	38	no
10	0.000E+00	-1.788E+02	0.000E+00	42	37	no
9	0.000E+00	-1.835E+02	0.000E+00	42	36	no
8	0.000E+00	-1.788E+02	0.000E+00	42	35	no
7	0.000E+00	-1.659E+02	0.000E+00	42	34	no
6	0.000E+00	-1.375E+02	0.000E+00	42	33	no
5	0.000E+00	-1.174E+02	0.000E+00	41	33	no
4	0.000E+00	-1.202E+02	0.000E+00	41	32	no
3	0.000E+00	-1.230E+02	0.000E+00	40	32	no
2	0.000E+00	-1.202E+02	0.000E+00	40	31	no
1	0.000E+00	-5.870E+01	0.000E+00	39	31	yes

Structural element data ...

Elem	ID	Nod1	Nod2	Prop		F-shear	F-axial	Mom-1	Mom-2
48	1	48	1	3	beam	2.114E+04	1.051E+05	8.496E+03	-4.947E-05
47	1	47	48	3	beam	-1.825E+04	1.247E+05	-1.466E+03	-8.395E+03
46	1	46	47	3	beam	1.235E+04	3.590E+04	6.037E+03	1.327E+03
45	1	45	46	3	beam	8.771E+03	2.244E+04	1.139E+04	-5.876E+03
44	1	44	45	3	beam	-8.593E+03	4.643E+04	5.649E+03	-1.105E+04
43	1	43	44	3	beam	-1.319E+04	8.965E+04	-2.074E+03	-5.786E+03
42	1	42	43	3	beam	1.915E+04	1.792E+05	8.464E+03	1.878E+03
41	1	41	42	3	beam	-2.202E+04	1.531E+05	8.363E-05	-8.849E+03
40	2	40	41	2	beam	-2.530E+02	7.635E+04	-1.017E+02	1.897E-05
39	2	39	40	2	beam	8.506E+02	6.820E+04	2.456E+02	1.129E+02
38	2	38	39	2	beam	-1.899E+03	9.264E+04	-5.713E+02	-2.290E+02
37	2	37	38	2	beam	3.990E+03	8.863E+04	1.011E+03	5.926E+02
36	2	36	37	2	beam	-6.063E+03	1.564E+05	-1.394E+03	-1.043E+03

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35	2	35	36	2	beam	2.690E+03	1.674E+05	6.106E+01	1.392E+03
34	2	34	35	2	beam	-2.697E+02	2.301E+05	-1.173E+02	-4.344E+01
33	2	33	34	2	beam	-2.990E+01	2.779E+05	-1.141E+02	9.531E+01
32	2	32	33	2	beam	5.310E+01	2.698E+05	-9.496E+01	1.283E+02
31	2	31	32	2	beam	2.500E+02	2.103E+05	3.458E+01	1.144E+02
30	2	30	31	2	beam	-2.769E+03	1.436E+05	-1.425E+03	-7.034E+01
29	2	29	30	2	beam	6.849E+03	1.516E+05	1.326E+03	1.427E+03
28	2	28	29	2	beam	-5.447E+03	6.572E+04	-8.814E+02	-1.308E+03
27	2	27	28	2	beam	3.400E+03	9.634E+04	5.541E+02	8.787E+02
26	2	26	27	2	beam	-1.772E+03	4.858E+04	-2.031E+02	-5.435E+02
25	2	25	26	2	beam	9.993E+02	4.756E+04	1.866E+02	2.151E+02
24	2	24	25	2	beam	-4.766E+02	2.919E+04	-2.842E+01	-1.632E+02
23	2	23	24	2	beam	7.762E+02	1.931E+04	3.857E+02	3.358E+01
22	2	22	23	2	beam	-1.200E+03	5.690E+02	-3.030E+02	-4.124E+02
21	2	21	22	2	beam	2.329E+03	-1.043E+04	1.162E+03	3.014E+02
20	2	20	21	2	beam	-1.919E+03	-8.451E+03	-5.519E+01	-1.151E+03
19	2	19	20	2	beam	2.375E+02	1.047E+04	1.056E+02	3.592E+01
18	2	18	19	2	beam	-1.306E+02	3.106E+04	4.782E+01	-1.184E+02
17	2	17	18	2	beam	2.014E+02	4.026E+04	1.331E+02	-5.211E+01
16	2	16	17	2	beam	-1.355E+03	6.308E+04	-3.986E+02	-1.459E+02
15	2	15	16	2	beam	2.972E+03	6.445E+04	8.146E+02	4.377E+02
14	2	14	15	2	beam	-6.271E+03	1.145E+05	-1.837E+03	-8.058E+02
13	2	13	14	2	beam	1.713E+04	7.636E+04	5.068E+03	1.818E+03
12	2	12	13	2	beam	1.799E+04	1.705E+05	3.181E+03	4.049E+03
11	2	11	12	2	beam	2.143E+04	1.534E+05	5.651E+03	5.926E+03
10	2	10	11	2	beam	6.971E+03	2.168E+05	7.275E+02	3.428E+03
9	2	9	10	2	beam	-1.558E+03	2.715E+05	-2.555E+02	-7.235E+02
8	2	8	9	2	beam	2.665E+02	2.729E+05	-1.012E+02	2.687E+02
7	2	7	8	2	beam	2.581E+02	2.204E+05	8.542E+01	6.843E+01
6	2	6	7	2	beam	-2.746E+03	1.553E+05	-1.412E+03	-7.175E+01
5	2	5	6	2	beam	6.242E+03	1.515E+05	1.078E+03	1.431E+03
4	2	4	5	2	beam	-4.382E+03	7.561E+04	-6.698E+02	-1.091E+03
3	2	3	4	2	beam	2.849E+03	9.097E+04	5.096E+02	6.909E+02
2	2	2	3	2	beam	-1.478E+03	5.658E+04	-1.268E+02	-4.960E+02
1	2	1	2	2	beam	2.872E+02	5.643E+04	1.383E+05	1.155E+02

Structural Properties ...

Prop Num.	Area	E	I	Dynamic Density	Plastic Moment
3	3.04800E-01	2.75800E+10	2.36000E-03	0.00000E+00	Not Set
2	3.78700E-03	1.64000E+11	1.72300E-05	0.00000E+00	Not Set
Prop. Num.	Cable Bond Stiffness	Cable Bond Strength	Yield Strength	Compressive Yield	Support Stiffness
3	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
2	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

>set log off

* log-file recording stopped 10-Aug-95 12:22

Title: ESF Ground Support - Structural Steel Analysis

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* FLAC log-file opened 10-Aug-95 12:22
Seismic Model @27+00: Ctg-3, Ko=0.25, W6x20 Steel Set
From File : m27_k2dy.sav
>pr stru

STATION: TSW2 @ 27+00

LOADING: SEISMIC + DL+UTIL

STEEL SET: W6X20 @ 4'-0" O.C.

Structural node data ...

Node	X	Y	X-disp	Y-disp	Ang-disp	Xfix	Yfix	Rfix	
48	1.704E+00	-3.408E+00	9.567E-04	-1.137E-03	-2.504E-04	no	no	no	
47	1.205E+00	-3.614E+00	9.055E-04	-1.028E-03	-2.029E-04	no	no	no	
46	6.264E-01	-3.758E+00	8.548E-04	-9.256E-04	-1.920E-04	no	no	no	
45	0.000E+00	-3.810E+00	8.044E-04	-8.514E-04	3.425E-06	no	no	no	
44	-6.264E-01	-3.758E+00	7.541E-04	-9.338E-04	2.122E-04	no	no	no	
43	-1.205E+00	-3.614E+00	7.013E-04	-1.050E-03	2.251E-04	no	no	no	
42	-1.704E+00	-3.408E+00	6.486E-04	-1.168E-03	2.688E-04	no	no	no	
41	-2.053E+00	-3.209E+00	5.910E-04	-1.271E-03	0.000E+00	no	no	no	
40	-2.380E+00	-2.975E+00	5.597E-04	-1.400E-03	2.964E-04	no	no	no	
39	-2.694E+00	-2.694E+00	5.188E-04	-1.528E-03	3.060E-04	no	no	no	
38	-2.975E+00	-2.380E+00	4.838E-04	-1.684E-03	2.764E-04	no	no	no	
37	-3.209E+00	-2.053E+00	4.510E-04	-1.813E-03	2.705E-04	no	no	no	
36	-3.408E+00	-1.704E+00	4.173E-04	-1.989E-03	2.685E-04	no	no	no	
35	-3.614E+00	-1.205E+00	3.837E-04	-2.195E-03	1.622E-04	no	no	no	
34	-3.758E+00	-6.264E-01	3.638E-04	-2.436E-03	8.985E-05	no	no	no	
33	-3.810E+00	0.000E+00	3.608E-04	-2.710E-03	-3.924E-06	no	no	no	
32	-3.758E+00	6.264E-01	3.700E-04	-2.976E-03	-9.629E-05	no	no	no	
31	-3.614E+00	1.205E+00	3.929E-04	-3.213E-03	-1.624E-04	no	no	no	
30	-3.408E+00	1.704E+00	4.270E-04	-3.408E-03	-2.537E-04	no	no	no	
29	-3.209E+00	2.053E+00	4.622E-04	-3.575E-03	-2.745E-04	no	no	no	
28	-2.975E+00	2.380E+00	4.970E-04	-3.704E-03	-2.660E-04	no	no	no	
27	-2.694E+00	2.694E+00	5.328E-04	-3.841E-03	-2.816E-04	no	no	no	
26	-2.380E+00	2.975E+00	5.790E-04	-3.953E-03	-2.808E-04	no	no	no	
25	-2.053E+00	3.209E+00	6.108E-04	-4.071E-03	-2.682E-04	no	no	no	
24	-1.704E+00	3.408E+00	6.530E-04	-4.161E-03	-2.355E-04	no	no	no	
23	-1.205E+00	3.614E+00	6.961E-04	-4.275E-03	-2.085E-04	no	no	no	
22	-6.264E-01	3.758E+00	7.543E-04	-4.379E-03	-1.726E-04	no	no	no	
21	0.000E+00	3.810E+00	8.303E-04	-4.429E-03	4.943E-06	no	no	no	
20	6.264E-01	3.758E+00	9.063E-04	-4.372E-03	1.916E-04	no	no	no	
19	1.205E+00	3.614E+00	9.630E-04	-4.255E-03	2.243E-04	no	no	no	
18	1.704E+00	3.408E+00	1.004E-03	-4.132E-03	2.514E-04	no	no	no	
17	2.053E+00	3.209E+00	1.044E-03	-4.033E-03	2.786E-04	no	no	no	
16	2.380E+00	2.975E+00	1.073E-03	-3.911E-03	2.833E-04	no	no	no	
15	2.694E+00	2.694E+00	1.113E-03	-3.788E-03	3.059E-04	no	no	no	
14	2.975E+00	2.380E+00	1.145E-03	-3.643E-03	2.151E-04	no	no	no	
13	3.209E+00	2.053E+00	1.173E-03	-3.514E-03	4.217E-04	no	no	no	
12	3.408E+00	1.704E+00	1.206E-03	-3.337E-03	3.591E-04	no	no	no	
11	3.614E+00	1.205E+00	1.235E-03	-3.138E-03	3.612E-04	no	no	no	
10	3.758E+00	6.264E-01	1.250E-03	-2.904E-03	2.714E-05	no	no	no	
9	3.810E+00	0.000E+00	1.253E-03	-2.634E-03	1.420E-05	no	no	no	
8	3.758E+00	-6.264E-01	1.248E-03	-2.362E-03	-9.538E-05	no	no	no	
7	3.614E+00	-1.205E+00	1.228E-03	-2.124E-03	-1.619E-04	no	no	no	
6	3.408E+00	-1.704E+00	1.194E-03	-1.919E-03	-2.636E-04	no	no	no	
5	3.209E+00	-2.053E+00	1.160E-03	-1.748E-03	-2.685E-04	no	no	no	
4	2.975E+00	-2.380E+00	1.126E-03	-1.621E-03	-2.741E-04	no	no	no	
3	2.694E+00	-2.694E+00	1.088E-03	-1.472E-03	-2.955E-04	no	no	no	
2	2.380E+00	-2.975E+00	1.044E-03	-1.355E-03	-2.861E-04	no	no	no	
1	2.053E+00	-3.209E+00	1.011E-03	-1.230E-03	0.000E+00	no	no	no	
Node	X-load	Y-load	Moment	i	j	Pin	Sh. force	Angle	Bond
48	0.000E+00	0.000E+00	0.000E+00	39	30	no			
47	0.000E+00	0.000E+00	0.000E+00	38	30	no			
46	0.000E+00	0.000E+00	0.000E+00	37	30	no			
45	0.000E+00	0.000E+00	0.000E+00	36	30	no			

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44	0.000E+00	0.000E+00	0.000E+00	35	30	no
43	0.000E+00	0.000E+00	0.000E+00	34	30	no
42	0.000E+00	0.000E+00	0.000E+00	33	30	no
41	0.000E+00	-5.870E+01	0.000E+00	33	31	yes
40	0.000E+00	-1.321E+03	0.000E+00	32	31	no
39	0.000E+00	-2.925E+03	0.000E+00	32	32	no
38	0.000E+00	-2.922E+03	0.000E+00	31	32	no
37	0.000E+00	-1.174E+02	0.000E+00	31	33	no
36	0.000E+00	-1.375E+02	0.000E+00	30	33	no
35	0.000E+00	-1.659E+02	0.000E+00	30	34	no
34	0.000E+00	-1.788E+02	0.000E+00	30	35	no
33	0.000E+00	-1.835E+02	0.000E+00	30	36	no
32	0.000E+00	-1.788E+02	0.000E+00	30	37	no
31	0.000E+00	-1.659E+02	0.000E+00	30	38	no
30	0.000E+00	-1.375E+02	0.000E+00	30	39	no
29	0.000E+00	-1.174E+02	0.000E+00	31	39	no
28	0.000E+00	-1.202E+02	0.000E+00	31	40	no
27	0.000E+00	-1.230E+02	0.000E+00	32	40	no
26	0.000E+00	-1.202E+02	0.000E+00	32	41	no
25	0.000E+00	-5.366E+03	0.000E+00	33	41	no
24	0.000E+00	-1.375E+02	0.000E+00	33	42	no
23	0.000E+00	-1.659E+02	0.000E+00	34	42	no
22	0.000E+00	-1.788E+02	0.000E+00	35	42	no
21	0.000E+00	-1.041E+04	0.000E+00	36	42	no
20	0.000E+00	-1.788E+02	0.000E+00	37	42	no
19	0.000E+00	-1.659E+02	0.000E+00	38	42	no
18	0.000E+00	-1.375E+02	0.000E+00	39	42	no
17	0.000E+00	-5.366E+03	0.000E+00	39	41	no
16	0.000E+00	-1.202E+02	0.000E+00	40	41	no
15	0.000E+00	-1.230E+02	0.000E+00	40	40	no
14	0.000E+00	-1.202E+02	0.000E+00	41	40	no
13	0.000E+00	-1.511E+04	9.085E+03	41	39	no
12	0.000E+00	-1.513E+04	9.085E+03	42	39	no
11	0.000E+00	-1.516E+04	9.085E+03	42	38	no
10	0.000E+00	-1.788E+02	0.000E+00	42	37	no
9	0.000E+00	-1.835E+02	0.000E+00	42	36	no
8	0.000E+00	-1.788E+02	0.000E+00	42	35	no
7	0.000E+00	-1.659E+02	0.000E+00	42	34	no
6	0.000E+00	-1.375E+02	0.000E+00	42	33	no
5	0.000E+00	-1.174E+02	0.000E+00	41	33	no
4	0.000E+00	-1.202E+02	0.000E+00	41	32	no
3	0.000E+00	-1.230E+02	0.000E+00	40	32	no
2	0.000E+00	-1.202E+02	0.000E+00	40	31	no
1	0.000E+00	-5.870E+01	0.000E+00	39	31	yes

Structural element data ...

Elem	ID	Nod1	Nod2	Prop		F-shear	F-axial	Mom-1	Mom-2
48	1	48	1	3	beam	2.517E+04	1.300E+04	1.012E+04	-6.228E-04
47	1	47	48	3	beam	-1.623E+04	-9.084E+04	1.345E+03	-1.011E+04
46	1	46	47	3	beam	-8.478E+02	-3.252E+05	9.166E+02	-1.422E+03
45	1	45	46	3	beam	6.151E+04	-6.061E+05	3.955E+04	-8.946E+02
44	1	44	45	3	beam	-5.715E+04	-5.975E+05	3.683E+03	-3.960E+04
43	1	43	44	3	beam	-7.453E+03	-3.142E+05	-8.160E+02	-3.626E+03
42	1	42	43	3	beam	2.329E+04	-5.331E+04	1.155E+04	1.029E+03
41	1	41	42	3	beam	-2.845E+04	3.529E+04	6.196E-04	-1.144E+04
40	2	40	41	2	beam	-1.020E+03	8.315E+04	-4.099E+02	1.170E-05
39	2	39	40	2	beam	2.291E+03	7.949E+04	5.471E+02	4.182E+02
38	2	38	39	2	beam	-3.465E+03	1.359E+05	-9.287E+02	-5.313E+02
37	2	37	38	2	beam	4.392E+03	1.346E+05	8.427E+02	9.226E+02
36	2	36	37	2	beam	-4.333E+03	2.104E+05	-8.861E+02	-8.557E+02

35	2	35	36	2	beam	1.229E+03	2.024E+05	-2.241E+02	8.880E+02
34	2	34	35	2	beam	-3.878E+02	2.418E+05	-4.588E+02	2.277E+02
33	2	33	34	2	beam	1.100E+02	2.705E+05	-3.869E+02	4.560E+02
32	2	32	33	2	beam	-7.586E+01	2.620E+05	-4.386E+02	3.909E+02
31	2	31	32	2	beam	4.598E+02	2.354E+05	-1.774E+02	4.514E+02
30	2	30	31	2	beam	-1.147E+03	1.937E+05	-7.869E+02	1.673E+02
29	2	29	30	2	beam	3.136E+03	1.951E+05	4.841E+02	7.765E+02
28	2	28	29	2	beam	-2.161E+03	1.329E+05	-3.754E+02	-4.932E+02
27	2	27	28	2	beam	1.260E+03	1.158E+05	1.622E+02	3.689E+02
26	2	26	27	2	beam	-6.152E+02	6.116E+04	-1.231E+02	-1.361E+02
25	2	25	26	2	beam	1.254E+03	6.446E+04	3.397E+02	1.643E+02
24	2	24	25	2	beam	-6.645E+02	1.290E+04	9.495E+01	-3.620E+02
23	2	23	24	2	beam	5.238E+01	4.353E+03	1.545E+02	-1.262E+02
22	2	22	23	2	beam	9.373E+01	-3.359E+04	1.994E+02	-1.435E+02
21	2	21	22	2	beam	1.926E+03	-7.019E+04	1.404E+03	-1.939E+02
20	2	20	21	2	beam	-1.811E+03	-6.894E+04	2.697E+02	-1.408E+03
19	2	19	20	2	beam	-2.919E+02	-2.841E+04	6.690E+01	-2.409E+02
18	2	18	19	2	beam	2.661E+02	1.034E+04	2.135E+02	-6.976E+01
17	2	17	18	2	beam	-3.061E+02	2.252E+04	1.299E+02	-2.529E+02
16	2	16	17	2	beam	-6.545E+02	7.210E+04	-9.768E+01	-1.654E+02
15	2	15	16	2	beam	1.234E+03	7.790E+04	4.123E+02	1.077E+02
14	2	14	15	2	beam	-4.629E+03	1.284E+05	-1.584E+03	-3.663E+02
13	2	13	14	2	beam	1.515E+04	1.393E+05	4.497E+03	1.591E+03
12	2	12	13	2	beam	2.080E+04	2.119E+05	3.739E+03	4.621E+03
11	2	11	12	2	beam	1.993E+04	1.982E+05	5.392E+03	5.375E+03
10	2	10	11	2	beam	6.991E+03	2.349E+05	5.019E+02	3.665E+03
9	2	9	10	2	beam	-1.748E+03	2.662E+05	-6.079E+02	-4.906E+02
8	2	8	9	2	beam	3.819E+02	2.681E+05	-3.730E+02	6.131E+02
7	2	7	8	2	beam	1.547E+02	2.377E+05	-2.682E+02	3.604E+02
6	2	6	7	2	beam	-9.483E+02	2.032E+05	-7.904E+02	2.782E+02
5	2	5	6	2	beam	3.763E+03	2.034E+05	7.230E+02	7.895E+02
4	2	4	5	2	beam	-3.865E+03	1.298E+05	-8.157E+02	-7.379E+02
3	2	3	4	2	beam	3.170E+03	1.261E+05	5.258E+02	8.099E+02
2	2	2	3	2	beam	-2.043E+03	6.751E+04	-3.689E+02	-4.920E+02
1	2	1	2	2	beam	8.836E+02	7.251E+04	2.242E-05	3.551E+02

Structural Properties ...

Prop Num.	Area	E	I	Dynamic Density	Plastic Moment
3	3.04800E-01	2.75800E+10	2.36000E-03	0.00000E+00	Not Set
2	3.78700E-03	1.64000E+11	1.72300E-05	0.00000E+00	Not Set
Prop. Num.	Cable Bond Stiffness	Cable Bond Strength	Yield Strength	Compressive Yield	Support Stiffness
3	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
2	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

set log off

log-file recording stopped 10-Aug-95 12:22

Title: ESF Ground Support - Structural Steel Analysis

* FLAC log-file opened 1-Sep-95 13:48

From File : m34c2k2d.sav
>pr stru

STATION: TSW2 @ 34+00

LOADING: SEISMIC + DL+UTIL

STEEL SET: W6X20 @ 4'-0" O.C.

Structural node data ...

Node	X	Y	X-disp	Y-disp	Ang-disp	Xfix	Yfix	Rfix	
48	1.704E+00	-3.408E+00	1.303E-03	-1.607E-03	-3.877E-04	no	no	no	
47	1.205E+00	-3.614E+00	1.225E-03	-1.430E-03	-3.139E-04	no	no	no	
46	6.264E-01	-3.758E+00	1.154E-03	-1.290E-03	-1.987E-04	no	no	no	
45	0.000E+00	-3.810E+00	1.098E-03	-1.246E-03	4.405E-05	no	no	no	
44	-6.264E-01	-3.758E+00	1.044E-03	-1.347E-03	2.788E-04	no	no	no	
43	-1.205E+00	-3.614E+00	9.712E-04	-1.524E-03	3.501E-04	no	no	no	
42	-1.704E+00	-3.408E+00	8.923E-04	-1.711E-03	3.933E-04	no	no	no	
41	-2.053E+00	-3.209E+00	8.158E-04	-1.852E-03	0.000E+00	no	no	no	
40	-2.380E+00	-2.975E+00	7.701E-04	-2.023E-03	4.156E-04	no	no	no	
39	-2.694E+00	-2.694E+00	7.069E-04	-2.206E-03	4.301E-04	no	no	no	
38	-2.975E+00	-2.380E+00	6.550E-04	-2.407E-03	3.555E-04	no	no	no	
37	-3.209E+00	-2.053E+00	6.088E-04	-2.575E-03	4.088E-04	no	no	no	
36	-3.408E+00	-1.704E+00	5.506E-04	-2.835E-03	3.799E-04	no	no	no	
35	-3.614E+00	-1.205E+00	5.197E-04	-3.101E-03	1.800E-04	no	no	no	
34	-3.758E+00	-6.264E-01	5.050E-04	-3.450E-03	1.182E-04	no	no	no	
33	-3.810E+00	0.000E+00	5.088E-04	-3.843E-03	-1.366E-05	no	no	no	
32	-3.758E+00	6.264E-01	5.167E-04	-4.228E-03	-1.182E-04	no	no	no	
31	-3.614E+00	1.205E+00	5.295E-04	-4.562E-03	-1.727E-04	no	no	no	
30	-3.408E+00	1.704E+00	5.605E-04	-4.823E-03	-3.754E-04	no	no	no	
29	-3.209E+00	2.053E+00	6.137E-04	-5.079E-03	-3.910E-04	no	no	no	
28	-2.975E+00	2.380E+00	6.635E-04	-5.241E-03	-3.644E-04	no	no	no	
27	-2.694E+00	2.694E+00	7.113E-04	-5.452E-03	-4.199E-04	no	no	no	
26	-2.380E+00	2.975E+00	7.721E-04	-5.614E-03	-3.651E-04	no	no	no	
25	-2.053E+00	3.209E+00	8.177E-04	-5.765E-03	-3.685E-04	no	no	no	
24	-1.704E+00	3.408E+00	8.747E-04	-5.896E-03	-3.471E-04	no	no	no	
23	-1.205E+00	3.614E+00	9.365E-04	-6.064E-03	-3.150E-04	no	no	no	
22	-6.264E-01	3.758E+00	1.020E-03	-6.219E-03	-2.690E-04	no	no	no	
21	0.000E+00	3.810E+00	1.129E-03	-6.315E-03	-1.613E-05	no	no	no	
20	6.264E-01	3.758E+00	1.237E-03	-6.229E-03	2.744E-04	no	no	no	
19	1.205E+00	3.614E+00	1.324E-03	-6.057E-03	3.601E-04	no	no	no	
18	1.704E+00	3.408E+00	1.389E-03	-5.870E-03	3.769E-04	no	no	no	
17	2.053E+00	3.209E+00	1.442E-03	-5.721E-03	4.041E-04	no	no	no	
16	2.380E+00	2.975E+00	1.483E-03	-5.550E-03	3.877E-04	no	no	no	
15	2.694E+00	2.694E+00	1.537E-03	-5.378E-03	4.170E-04	no	no	no	
14	2.975E+00	2.380E+00	1.576E-03	-5.170E-03	3.013E-04	no	no	no	
13	3.209E+00	2.053E+00	1.618E-03	-5.009E-03	5.404E-04	no	no	no	
12	3.408E+00	1.704E+00	1.671E-03	-4.738E-03	4.840E-04	no	no	no	
11	3.614E+00	1.205E+00	1.701E-03	-4.472E-03	3.949E-04	no	no	no	
10	3.758E+00	6.264E-01	1.713E-03	-4.126E-03	4.581E-05	no	no	no	
9	3.810E+00	0.000E+00	1.704E-03	-3.739E-03	1.002E-05	no	no	no	
8	3.758E+00	-6.264E-01	1.706E-03	-3.345E-03	-1.188E-04	no	no	no	
7	3.614E+00	-1.205E+00	1.691E-03	-2.998E-03	-1.880E-04	no	no	no	
6	3.408E+00	-1.704E+00	1.656E-03	-2.726E-03	-3.855E-04	no	no	no	
5	3.209E+00	-2.053E+00	1.598E-03	-2.470E-03	-3.978E-04	no	no	no	
4	2.975E+00	-2.380E+00	1.554E-03	-2.302E-03	-3.625E-04	no	no	no	
3	2.694E+00	-2.694E+00	1.499E-03	-2.092E-03	-4.417E-04	no	no	no	
2	2.380E+00	-2.975E+00	1.431E-03	-1.916E-03	-4.110E-04	no	no	no	
1	2.053E+00	-3.209E+00	1.381E-03	-1.749E-03	0.000E+00	no	no	no	
Node	X-load	Y-load	Moment	i	j	Pin	Sh. force	Angle	Bond
48	0.000E+00	0.000E+00	0.000E+00	39	30	no			
47	0.000E+00	0.000E+00	0.000E+00	38	30	no			
46	0.000E+00	0.000E+00	0.000E+00	37	30	no			
45	0.000E+00	0.000E+00	0.000E+00	36	30	no			

Title: ESF Ground Support - Structural Steel Analysis

44	0.000E+00	0.000E+00	0.000E+00	35	30	no
43	0.000E+00	0.000E+00	0.000E+00	34	30	no
42	0.000E+00	0.000E+00	0.000E+00	33	30	no
41	0.000E+00	-5.870E+01	0.000E+00	33	31	yes
40	0.000E+00	-1.321E+03	0.000E+00	32	31	no
39	0.000E+00	-2.925E+03	0.000E+00	32	32	no
38	0.000E+00	-2.922E+03	0.000E+00	31	32	no
37	0.000E+00	-1.174E+02	0.000E+00	31	33	no
36	0.000E+00	-1.375E+02	0.000E+00	30	33	no
35	0.000E+00	-1.659E+02	0.000E+00	30	34	no
34	0.000E+00	-1.788E+02	0.000E+00	30	35	no
33	0.000E+00	-1.835E+02	0.000E+00	30	36	no
32	0.000E+00	-1.788E+02	0.000E+00	30	37	no
31	0.000E+00	-1.659E+02	0.000E+00	30	38	no
30	0.000E+00	-1.375E+02	0.000E+00	30	39	no
29	0.000E+00	-1.174E+02	0.000E+00	31	39	no
28	0.000E+00	-1.202E+02	0.000E+00	31	40	no
27	0.000E+00	-1.230E+02	0.000E+00	32	40	no
26	0.000E+00	-1.202E+02	0.000E+00	32	41	no
25	0.000E+00	-5.233E+03	0.000E+00	33	41	no
24	0.000E+00	-1.375E+02	0.000E+00	33	42	no
23	0.000E+00	-1.659E+02	0.000E+00	34	42	no
22	0.000E+00	-1.788E+02	0.000E+00	35	42	no
21	0.000E+00	-1.041E+04	0.000E+00	36	42	no
20	0.000E+00	-1.788E+02	0.000E+00	37	42	no
19	0.000E+00	-1.659E+02	0.000E+00	38	42	no
18	0.000E+00	-1.375E+02	0.000E+00	39	42	no
17	0.000E+00	-5.233E+03	0.000E+00	39	41	no
16	0.000E+00	-1.202E+02	0.000E+00	40	41	no
15	0.000E+00	-1.230E+02	0.000E+00	40	40	no
14	0.000E+00	-1.202E+02	0.000E+00	41	40	no
13	0.000E+00	-1.511E+04	9.085E+03	41	39	no
12	0.000E+00	-1.513E+04	9.085E+03	42	39	no
11	0.000E+00	-1.516E+04	9.085E+03	42	38	no
10	0.000E+00	-1.788E+02	0.000E+00	42	37	no
9	0.000E+00	-1.835E+02	0.000E+00	42	36	no
8	0.000E+00	-1.788E+02	0.000E+00	42	35	no
7	0.000E+00	-1.659E+02	0.000E+00	42	34	no
6	0.000E+00	-1.375E+02	0.000E+00	42	33	no
5	0.000E+00	-1.174E+02	0.000E+00	41	33	no
4	0.000E+00	-1.202E+02	0.000E+00	41	32	no
3	0.000E+00	-1.230E+02	0.000E+00	40	32	no
2	0.000E+00	-1.202E+02	0.000E+00	40	31	no
1	0.000E+00	-5.870E+01	0.000E+00	39	31	yes

Structural element data ...

Elem ID	Nod1	Nod2	Prop		F-shear	F-axial	Mom-1	Mom-2	
48	1	48	1	3	beam	1.224E+04	3.408E+04	4.920E+03	7.436E-04
47	1	47	48	3	beam	1.471E+04	-8.274E+04	1.284E+04	-4.891E+03
46	1	46	47	3	beam	-4.140E+02	-4.607E+05	1.248E+04	-1.273E+04
45	1	45	46	3	beam	4.180E+04	-6.958E+05	3.826E+04	-1.199E+04
44	1	44	45	3	beam	-4.524E+04	-6.383E+05	1.009E+04	-3.853E+04
43	1	43	44	3	beam	-8.835E+03	-3.679E+05	5.164E+03	-1.043E+04
42	1	42	43	3	beam	7.250E+02	-2.962E+04	5.407E+03	-5.015E+03
41	1	41	42	3	beam	-1.283E+04	7.048E+04	-6.804E-04	-5.156E+03
40	2	40	41	2	beam	2.859E+02	9.673E+04	1.149E+02	-9.523E-06
39	2	39	40	2	beam	-3.852E+01	1.086E+05	8.724E+01	-1.035E+02
38	2	38	39	2	beam	-3.044E+03	1.700E+05	-1.139E+03	-1.440E+02
37	2	37	38	2	beam	7.595E+03	1.746E+05	1.904E+03	1.149E+03
36	2	36	37	2	beam	-1.045E+04	3.030E+05	-2.308E+03	-1.894E+03

35	2	35	36	2	beam	4.502E+03	2.683E+05	1.685E+02	2.263E+03
34	2	34	35	2	beam	-1.577E+03	3.511E+05	-7.597E+02	-1.805E+02
33	2	33	34	2	beam	5.959E+02	3.889E+05	-4.072E+02	7.817E+02
32	2	32	33	2	beam	-2.776E+02	3.808E+05	-5.575E+02	3.830E+02
31	2	31	32	2	beam	9.520E+02	3.342E+05	2.836E+01	5.391E+02
30	2	30	31	2	beam	-4.007E+03	2.647E+05	-2.145E+03	-1.966E+01
29	2	29	30	2	beam	1.021E+04	3.059E+05	1.944E+03	2.160E+03
28	2	28	29	2	beam	-8.473E+03	1.555E+05	-1.517E+03	-1.889E+03
27	2	27	28	2	beam	5.533E+03	1.859E+05	7.916E+02	1.540E+03
26	2	26	27	2	beam	-2.190E+03	9.413E+04	-9.109E+01	-8.318E+02
25	2	25	26	2	beam	3.659E+02	7.653E+04	4.763E+01	9.945E+01
24	2	24	25	2	beam	3.598E+02	2.497E+04	2.202E+02	-7.559E+01
23	2	23	24	2	beam	-4.343E+02	6.712E+03	5.334E+01	-2.880E+02
22	2	22	23	2	beam	5.869E+02	-4.162E+04	3.940E+02	-4.415E+01
21	2	21	22	2	beam	2.349E+03	-9.944E+04	1.873E+03	-3.964E+02
20	2	20	21	2	beam	-1.784E+03	-1.022E+05	7.469E+02	-1.868E+03
19	2	19	20	2	beam	-1.101E+03	-4.084E+04	7.766E+01	-7.337E+02
18	2	18	19	2	beam	-1.918E+01	1.497E+04	8.330E+01	-9.366E+01
17	2	17	18	2	beam	5.881E+02	4.057E+04	3.106E+02	-7.421E+01
16	2	16	17	2	beam	-2.079E+03	1.010E+05	-5.359E+02	-2.998E+02
15	2	15	16	2	beam	3.358E+03	1.086E+05	9.029E+02	5.121E+02
14	2	14	15	2	beam	-7.922E+03	1.926E+05	-2.441E+03	-8.967E+02
13	2	13	14	2	beam	2.055E+04	1.666E+05	5.809E+03	2.452E+03
12	2	12	13	2	beam	1.408E+04	3.208E+05	2.432E+03	3.228E+03
11	2	11	12	2	beam	2.279E+04	2.714E+05	5.693E+03	6.618E+03
10	2	10	11	2	beam	5.969E+03	3.466E+05	1.226E+02	3.435E+03
9	2	9	10	2	beam	-9.118E+02	3.837E+05	-4.487E+02	-1.244E+02
8	2	8	9	2	beam	-4.532E+02	3.887E+05	-7.193E+02	4.344E+02
7	2	7	8	2	beam	1.353E+03	3.501E+05	7.453E+01	7.318E+02
6	2	6	7	2	beam	-4.106E+03	2.741E+05	-2.143E+03	-7.483E+01
5	2	5	6	2	beam	1.029E+04	2.975E+05	1.981E+03	2.155E+03
4	2	4	5	2	beam	-8.626E+03	1.738E+05	-1.484E+03	-1.983E+03
3	2	3	4	2	beam	4.496E+03	1.747E+05	4.160E+02	1.479E+03
2	2	2	3	2	beam	-9.207E+02	1.012E+05	1.164E+01	-3.996E+02
1	2	1	2	2	beam	3.147E+01	8.650E+04	6.371E-05	1.265E+01

Structural Properties ...

Prop Num.	Area	E	I	Dynamic Density	Plastic Moment
3	3.04800E-01	2.75800E+10	2.36000E-03	0.00000E+00	Not Set
2	3.78700E-03	1.64000E+11	1.72300E-05	0.00000E+00	Not Set
Prop. Num.	Cable Bond Stiffness	Cable Bond Strength	Yield Strength	Compressive Yield	Support Stiffness
3	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
2	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

>set log off

* log-file recording stopped 1-Sep-95 13:48

* FLAC log-file opened 1-Sep-95 13:52

From File : m34c2k2d.sav

>pr stru

Structural node data ...

Node	X	Y	X-disp	Y-disp	Ang-disp	Xfix	Yfix	Rfix
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[illegible]

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STATION: TSW2 @ 53+00

LOADING: SEISMIC + DL+UTIL

STEEL SET: W6X20 @ 4'-0" O.C.

* FLAC log-file opened 10-Aug-95 12:23
 Seismic Model @53+00: Ctg-3, Ko=0.25, W6x20 Steel Set
 From File : m53_k2dy.sav
 >or stru

Structural node data ...

Node	X	Y	X-disp	Y-disp	Ang-disp	Xfix	Yfix	Rfix	
48	1.704E+00	-3.408E+00	9.579E-04	-1.127E-03	-2.457E-04	no	no	no	
47	1.205E+00	-3.614E+00	9.082E-04	-1.020E-03	-1.987E-04	no	no	no	
46	6.264E-01	-3.758E+00	8.575E-04	-9.185E-04	-1.893E-04	no	no	no	
45	0.000E+00	-3.810E+00	8.077E-04	-8.474E-04	4.899E-06	no	no	no	
44	-6.264E-01	-3.758E+00	7.583E-04	-9.285E-04	2.073E-04	no	no	no	
43	-1.205E+00	-3.614E+00	7.062E-04	-1.042E-03	2.227E-04	no	no	no	
42	-1.704E+00	-3.408E+00	6.532E-04	-1.159E-03	2.639E-04	no	no	no	
41	-2.053E+00	-3.209E+00	5.977E-04	-1.257E-03	0.000E+00	no	no	no	
40	-2.380E+00	-2.975E+00	5.648E-04	-1.390E-03	3.026E-04	no	no	no	
39	-2.694E+00	-2.694E+00	5.199E-04	-1.515E-03	3.116E-04	no	no	no	
38	-2.975E+00	-2.380E+00	4.834E-04	-1.671E-03	2.765E-04	no	no	no	
37	-3.209E+00	-2.053E+00	4.495E-04	-1.801E-03	2.756E-04	no	no	no	
36	-3.408E+00	-1.704E+00	4.157E-04	-1.979E-03	2.721E-04	no	no	no	
35	-3.614E+00	-1.205E+00	3.826E-04	-2.190E-03	1.628E-04	no	no	no	
34	-3.758E+00	-6.264E-01	3.647E-04	-2.433E-03	8.601E-05	no	no	no	
33	-3.810E+00	0.000E+00	3.637E-04	-2.707E-03	-6.605E-06	no	no	no	
32	-3.758E+00	6.264E-01	3.729E-04	-2.978E-03	-9.557E-05	no	no	no	
31	-3.614E+00	1.205E+00	3.942E-04	-3.212E-03	-1.561E-04	no	no	no	
30	-3.408E+00	1.704E+00	4.271E-04	-3.407E-03	-2.576E-04	no	no	no	
29	-3.209E+00	2.053E+00	4.618E-04	-3.578E-03	-2.753E-04	no	no	no	
28	-2.975E+00	2.380E+00	4.957E-04	-3.708E-03	-2.684E-04	no	no	no	
27	-2.694E+00	2.694E+00	5.306E-04	-3.851E-03	-2.863E-04	no	no	no	
26	-2.380E+00	2.975E+00	5.705E-04	-3.972E-03	-2.886E-04	no	no	no	
25	-2.053E+00	3.209E+00	6.012E-04	-4.098E-03	-3.017E-04	no	no	no	
24	-1.704E+00	3.408E+00	6.466E-04	-4.205E-03	-2.719E-04	no	no	no	
23	-1.205E+00	3.614E+00	6.923E-04	-4.336E-03	-2.327E-04	no	no	no	
22	-6.264E-01	3.758E+00	7.599E-04	-4.444E-03	-1.591E-04	no	no	no	
21	0.000E+00	3.810E+00	8.393E-04	-4.478E-03	2.132E-05	no	no	no	
20	6.264E-01	3.758E+00	9.147E-04	-4.418E-03	1.970E-04	no	no	no	
19	1.205E+00	3.614E+00	9.717E-04	-4.291E-03	2.266E-04	no	no	no	
18	1.704E+00	3.408E+00	1.011E-03	-4.173E-03	2.507E-04	no	no	no	
17	2.053E+00	3.209E+00	1.054E-03	-4.069E-03	3.035E-04	no	no	no	
16	2.380E+00	2.975E+00	1.081E-03	-3.940E-03	2.828E-04	no	no	no	
15	2.694E+00	2.694E+00	1.118E-03	-3.820E-03	2.895E-04	no	no	no	
14	2.975E+00	2.380E+00	1.149E-03	-3.677E-03	2.187E-04	no	no	no	
13	3.209E+00	2.053E+00	1.179E-03	-3.547E-03	4.307E-04	no	no	no	
12	3.408E+00	1.704E+00	1.214E-03	-3.363E-03	3.676E-04	no	no	no	
11	3.614E+00	1.205E+00	1.244E-03	-3.161E-03	3.669E-04	no	no	no	
10	3.758E+00	6.264E-01	1.260E-03	-2.917E-03	2.764E-05	no	no	no	
9	3.810E+00	0.000E+00	1.260E-03	-2.642E-03	1.063E-05	no	no	no	
8	3.758E+00	-6.264E-01	1.255E-03	-2.368E-03	-9.623E-05	no	no	no	
7	3.614E+00	-1.205E+00	1.234E-03	-2.123E-03	-1.657E-04	no	no	no	
6	3.408E+00	-1.704E+00	1.199E-03	-1.914E-03	-2.709E-04	no	no	no	
5	3.209E+00	-2.053E+00	1.164E-03	-1.738E-03	-2.784E-04	no	no	no	
4	2.975E+00	-2.380E+00	1.126E-03	-1.612E-03	-2.781E-04	no	no	no	
3	2.694E+00	-2.694E+00	1.089E-03	-1.460E-03	-2.952E-04	no	no	no	
2	2.380E+00	-2.975E+00	1.046E-03	-1.345E-03	-2.856E-04	no	no	no	
1	2.053E+00	-3.209E+00	1.011E-03	-1.218E-03	0.000E+00	no	no	no	
Node	X-load	Y-load	Moment	i	j	Pin	Sh. force	Angle	Bond
48	0.000E+00	0.000E+00	0.000E+00	39	30	no			
47	0.000E+00	0.000E+00	0.000E+00	38	30	no			
46	0.000E+00	0.000E+00	0.000E+00	37	30	no			
45	0.000E+00	0.000E+00	0.000E+00	36	30	no			

Title: ESF Ground Support - Structural Steel Analysis

44	0.000E+00	0.000E+00	0.000E+00	35	30	no
43	0.000E+00	0.000E+00	0.000E+00	34	30	no
42	0.000E+00	0.000E+00	0.000E+00	33	30	no
41	0.000E+00	-5.870E+01	0.000E+00	33	31	yes
40	0.000E+00	-1.321E+03	0.000E+00	32	31	no
39	0.000E+00	-2.925E+03	0.000E+00	32	32	no
38	0.000E+00	-2.922E+03	0.000E+00	31	32	no
37	0.000E+00	-1.174E+02	0.000E+00	31	33	no
36	0.000E+00	-1.375E+02	0.000E+00	30	33	no
35	0.000E+00	-1.659E+02	0.000E+00	30	34	no
34	0.000E+00	-1.788E+02	0.000E+00	30	35	no
33	0.000E+00	-1.835E+02	0.000E+00	30	36	no
32	0.000E+00	-1.788E+02	0.000E+00	30	37	no
31	0.000E+00	-1.659E+02	0.000E+00	30	38	no
30	0.000E+00	-1.375E+02	0.000E+00	30	39	no
29	0.000E+00	-1.174E+02	0.000E+00	31	39	no
28	0.000E+00	-1.202E+02	0.000E+00	31	40	no
27	0.000E+00	-1.230E+02	0.000E+00	32	40	no
26	0.000E+00	-1.202E+02	0.000E+00	32	41	no
25	0.000E+00	-5.366E+03	0.000E+00	33	41	no
24	0.000E+00	-1.375E+02	0.000E+00	33	42	no
23	0.000E+00	-1.659E+02	0.000E+00	34	42	no
22	0.000E+00	-1.788E+02	0.000E+00	35	42	no
21	0.000E+00	-1.041E+04	0.000E+00	36	42	no
20	0.000E+00	-1.788E+02	0.000E+00	37	42	no
19	0.000E+00	-1.659E+02	0.000E+00	38	42	no
18	0.000E+00	-1.375E+02	0.000E+00	39	42	no
17	0.000E+00	-5.366E+03	0.000E+00	39	41	no
16	0.000E+00	-1.202E+02	0.000E+00	40	41	no
15	0.000E+00	-1.230E+02	0.000E+00	40	40	no
14	0.000E+00	-1.202E+02	0.000E+00	41	40	no
13	0.000E+00	-1.511E+04	9.085E+03	41	39	no
12	0.000E+00	-1.513E+04	9.085E+03	42	39	no
11	0.000E+00	-1.516E+04	9.085E+03	42	38	no
10	0.000E+00	-1.788E+02	0.000E+00	42	37	no
9	0.000E+00	-1.835E+02	0.000E+00	42	36	no
8	0.000E+00	-1.788E+02	0.000E+00	42	35	no
7	0.000E+00	-1.659E+02	0.000E+00	42	34	no
6	0.000E+00	-1.375E+02	0.000E+00	42	33	no
5	0.000E+00	-1.174E+02	0.000E+00	41	33	no
4	0.000E+00	-1.202E+02	0.000E+00	41	32	no
3	0.000E+00	-1.230E+02	0.000E+00	40	32	no
2	0.000E+00	-1.202E+02	0.000E+00	40	31	no
1	0.000E+00	-5.870E+01	0.000E+00	39	31	yes

Structural element data ...

Elem ID	Nod1	Nod2	Prop		F-shear	F-axial	Mom-1	Mom-2
48	1	48	1	3	beam	2.456E+04	1.328E+04	9.870E+03
47	1	47	48	3	beam	-1.650E+04	-9.763E+04	1.204E+03
46	1	46	47	3	beam	-1.485E+03	-3.244E+05	6.037E+02
45	1	45	46	3	beam	6.224E+04	-5.979E+05	3.964E+04
44	1	44	45	3	beam	-5.935E+04	-5.905E+05	2.343E+03
43	1	43	44	3	beam	-1.590E+03	-3.004E+05	1.214E+03
42	1	42	43	3	beam	1.476E+04	-7.188E+04	8.908E+03
41	1	41	42	3	beam	-2.250E+04	4.287E+04	-6.072E-04
40	2	40	41	2	beam	-5.696E+02	7.827E+04	-2.289E+02
39	2	39	40	2	beam	1.379E+03	7.542E+04	3.514E+02
38	2	38	39	2	beam	-2.703E+03	1.348E+05	-8.057E+02
37	2	37	38	2	beam	4.039E+03	1.346E+05	8.039E+02
36	2	36	37	2	beam	-4.199E+03	2.138E+05	-8.667E+02

Title: ESF Ground Support - Structural Steel Analysis**Page: II-47 of II-62**

35	2	35	36	2	beam	1.104E+03	2.102E+05	-2.731E+02	8.692E+02
34	2	34	35	2	beam	-2.609E+02	2.421E+05	-4.421E+02	2.866E+02
33	2	33	34	2	beam	8.347E+01	2.708E+05	-3.911E+02	4.435E+02
32	2	32	33	2	beam	-5.726E+01	2.672E+05	-4.174E+02	3.814E+02
31	2	31	32	2	beam	4.537E+02	2.332E+05	-1.518E+02	4.223E+02
30	2	30	31	2	beam	-1.400E+03	1.930E+05	-9.094E+02	1.533E+02
29	2	29	30	2	beam	3.878E+03	2.014E+05	6.564E+02	9.022E+02
28	2	28	29	2	beam	-2.745E+03	1.358E+05	-5.045E+02	-5.988E+02
27	2	27	28	2	beam	1.740E+03	1.213E+05	2.450E+02	4.881E+02
26	2	26	27	2	beam	-1.440E+03	7.437E+04	-3.158E+02	-2.910E+02
25	2	25	26	2	beam	1.239E+03	7.659E+04	1.570E+02	3.412E+02
24	2	24	25	2	beam	3.245E+02	2.170E+04	2.745E+02	-1.441E+02
23	2	23	24	2	beam	-1.883E+02	7.873E+03	1.531E+02	-2.548E+02
22	2	22	23	2	beam	6.731E+02	-4.108E+04	5.497E+02	-1.484E+02
21	2	21	22	2	beam	7.895E+02	-7.525E+04	1.059E+03	-5.627E+02
20	2	20	21	2	beam	-9.206E+02	-6.806E+04	5.002E+02	-1.079E+03
19	2	19	20	2	beam	-1.217E+03	-2.736E+04	-2.208E+02	-5.043E+02
18	2	18	19	2	beam	1.338E+03	9.211E+03	4.863E+02	2.367E+02
17	2	17	18	2	beam	-6.803E+02	2.407E+04	2.353E+02	-5.088E+02
16	2	16	17	2	beam	-1.924E+03	8.265E+04	-5.297E+02	-2.434E+02
15	2	15	16	2	beam	2.903E+03	7.583E+04	6.557E+02	5.677E+02
14	2	14	15	2	beam	-5.312E+03	1.275E+05	-1.595E+03	-6.437E+02
13	2	13	14	2	beam	1.540E+04	1.398E+05	4.586E+03	1.605E+03
12	2	12	13	2	beam	2.026E+04	2.172E+05	3.628E+03	4.516E+03
11	2	11	12	2	beam	2.021E+04	2.024E+05	5.454E+03	5.463E+03
10	2	10	11	2	beam	6.737E+03	2.452E+05	4.013E+02	3.614E+03
9	2	9	10	2	beam	-1.510E+03	2.712E+05	-5.517E+02	-3.973E+02
8	2	8	9	2	beam	2.513E+02	2.694E+05	-4.023E+02	5.602E+02
7	2	7	8	2	beam	2.391E+02	2.437E+05	-2.570E+02	3.995E+02
6	2	6	7	2	beam	-1.002E+03	2.081E+05	-8.227E+02	2.817E+02
5	2	5	6	2	beam	3.776E+03	2.078E+05	7.077E+02	8.100E+02
4	2	4	5	2	beam	-3.676E+03	1.291E+05	-7.356E+02	-7.419E+02
3	2	3	4	2	beam	3.033E+03	1.280E+05	5.228E+02	7.551E+02
2	2	2	3	2	beam	-2.105E+03	6.810E+04	-3.791E+02	-5.080E+02
1	2	1	2	2	beam	9.359E+02	7.082E+04	-2.541E+05	3.762E+02

Structural Properties ...

Prop Num.	Area	E	I	Dynamic Density	Plastic Moment
3	3.04800E-01	2.75800E+10	2.36000E-03	0.00000E+00	Not Set
2	3.78700E-03	1.64000E+11	1.72300E-05	0.00000E+00	Not Set
Prop. Num.	Cable Bond Stiffness	Cable Bond Strength	Yield Strength	Compressive Yield	Support Stiffness
3	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
2	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

>set log off
 * log-file recording stopped 10-Aug-95 12:23

Title: ESF Ground Support - Structural Steel Analysis

STATION: TCW @ 07+00

LOADING: STATIC; DL+UTIL

STEEL SET: W6X20 @ 4'-0" O.C.

* FLAC log-file opened 11-Aug-95 14:31

From File : flac.ini

>res m07_k2.sav

a following state has been restored:

date	time	step	grid	version
8-Aug-95	10:18	5220	70 X 70	3.22

Title:

>pr stru

Structural node data ...

Node	X	Y	X-disp	Y-disp	Ang-disp	Xfix	Yfix	Rfix
48	1.704E+00	-3.408E+00	5.018E-05	4.332E-04	-6.863E-05	no	no	no
47	1.205E+00	-3.614E+00	3.413E-05	4.638E-04	-5.933E-05	no	no	no
46	6.264E-01	-3.758E+00	1.791E-05	4.952E-04	-5.040E-05	no	no	no
45	0.000E+00	-3.810E+00	2.110E-06	5.117E-04	-9.144E-06	no	no	no
44	-6.264E-01	-3.758E+00	-1.408E-05	5.054E-04	3.975E-05	no	no	no
43	-1.205E+00	-3.614E+00	-3.136E-05	4.761E-04	6.507E-05	no	no	no
42	-1.704E+00	-3.408E+00	-4.940E-05	4.408E-04	7.672E-05	no	no	no
41	-2.053E+00	-3.209E+00	-6.530E-05	4.147E-04	0.000E+00	no	no	no
40	-2.380E+00	-2.975E+00	-7.822E-05	3.852E-04	8.145E-05	no	no	no
39	-2.694E+00	-2.694E+00	-9.550E-05	3.527E-04	8.723E-05	no	no	no
38	-2.975E+00	-2.380E+00	-1.078E-04	3.136E-04	7.657E-05	no	no	no
37	-3.209E+00	-2.053E+00	-1.200E-04	2.806E-04	7.741E-05	no	no	no
36	-3.408E+00	-1.704E+00	-1.317E-04	2.377E-04	7.276E-05	no	no	no
35	-3.614E+00	-1.205E+00	-1.423E-04	1.817E-04	4.610E-05	no	no	no
34	-3.758E+00	-6.264E-01	-1.491E-04	1.178E-04	2.664E-05	no	no	no
33	-3.810E+00	0.000E+00	-1.521E-04	4.832E-05	9.577E-07	no	no	no
32	-3.758E+00	6.264E-01	-1.496E-04	-1.995E-05	-2.688E-05	no	no	no
31	-3.614E+00	1.205E+00	-1.429E-04	-8.366E-05	-4.262E-05	no	no	no
30	-3.408E+00	1.704E+00	-1.354E-04	-1.363E-04	-6.593E-05	no	no	no
29	-3.209E+00	2.053E+00	-1.242E-04	-1.789E-04	-7.875E-05	no	no	no
28	-2.975E+00	2.380E+00	-1.126E-04	-2.156E-04	-7.943E-05	no	no	no
27	-2.694E+00	2.694E+00	-1.020E-04	-2.540E-04	-7.866E-05	no	no	no
26	-2.380E+00	2.975E+00	-8.889E-05	-2.866E-04	-7.974E-05	no	no	no
25	-2.053E+00	3.209E+00	-7.910E-05	-3.208E-04	-8.314E-05	no	no	no
24	-1.704E+00	3.408E+00	-6.548E-05	-3.498E-04	-7.733E-05	no	no	no
23	-1.205E+00	3.614E+00	-4.967E-05	-3.859E-04	-7.142E-05	no	no	no
22	-6.264E-01	3.758E+00	-2.788E-05	-4.187E-04	-5.288E-05	no	no	no
21	0.000E+00	3.810E+00	-1.787E-06	-4.354E-04	-2.273E-06	no	no	no
20	6.264E-01	3.758E+00	2.444E-05	-4.209E-04	4.993E-05	no	no	no
19	1.205E+00	3.614E+00	4.654E-05	-3.894E-04	7.074E-05	no	no	no
18	1.704E+00	3.408E+00	6.292E-05	-3.536E-04	7.809E-05	no	no	no
17	2.053E+00	3.209E+00	7.655E-05	-3.248E-04	8.123E-05	no	no	no
16	2.380E+00	2.975E+00	8.661E-05	-2.918E-04	7.702E-05	no	no	no
15	2.694E+00	2.694E+00	1.002E-04	-2.580E-04	9.209E-05	no	no	no
14	2.975E+00	2.380E+00	1.106E-04	-2.200E-04	3.531E-05	no	no	no
13	3.209E+00	2.053E+00	1.222E-04	-1.856E-04	2.264E-04	no	no	no
12	3.408E+00	1.704E+00	1.344E-04	-1.418E-04	1.676E-04	no	no	no
11	3.614E+00	1.205E+00	1.442E-04	-8.857E-05	2.619E-04	no	no	no
10	3.758E+00	6.264E-01	1.516E-04	-2.438E-05	-3.258E-05	no	no	no
9	3.810E+00	0.000E+00	1.533E-04	4.428E-05	1.440E-05	no	no	no
8	3.758E+00	-6.264E-01	1.502E-04	1.136E-04	-3.247E-05	no	no	no
7	3.614E+00	-1.205E+00	1.428E-04	1.782E-04	-4.391E-05	no	no	no
6	3.408E+00	-1.704E+00	1.329E-04	2.329E-04	-7.335E-05	no	no	no
5	3.209E+00	-2.053E+00	1.202E-04	2.760E-04	-7.847E-05	no	no	no
4	2.975E+00	-2.380E+00	1.080E-04	3.088E-04	-7.580E-05	no	no	no
3	2.694E+00	-2.694E+00	9.540E-05	3.475E-04	-8.764E-05	no	no	no
2	2.380E+00	-2.975E+00	7.760E-05	3.795E-04	-8.119E-05	no	no	no

Title: ESF Ground Support - Structural Steel Analysis

1	2.053E+00	-3.209E+00	6.523E-05	4.088E-04	0.000E+00	no	no	no
Node	X-load	Y-load	Moment	i j Pin	Sh. force	Angle	Bond	
48	0.000E+00	0.000E+00	0.000E+00	39 30 no				
47	0.000E+00	0.000E+00	0.000E+00	38 30 no				
46	0.000E+00	0.000E+00	0.000E+00	37 30 no				
45	0.000E+00	0.000E+00	0.000E+00	36 30 no				
44	0.000E+00	0.000E+00	0.000E+00	35 30 no				
43	0.000E+00	0.000E+00	0.000E+00	34 30 no				
42	0.000E+00	0.000E+00	0.000E+00	33 30 no				
41	0.000E+00	-5.870E+01	0.000E+00	33 31 yes				
40	0.000E+00	-1.321E+03	0.000E+00	32 31 no				
39	0.000E+00	-2.925E+03	0.000E+00	32 32 no				
38	0.000E+00	-2.922E+03	0.000E+00	31 32 no				
37	0.000E+00	-1.174E+02	0.000E+00	31 33 no				
36	0.000E+00	-1.375E+02	0.000E+00	30 33 no				
35	0.000E+00	-1.659E+02	0.000E+00	30 34 no				
34	0.000E+00	-1.788E+02	0.000E+00	30 35 no				
33	0.000E+00	-1.835E+02	0.000E+00	30 36 no				
32	0.000E+00	-1.788E+02	0.000E+00	30 37 no				
31	0.000E+00	-1.659E+02	0.000E+00	30 38 no				
30	0.000E+00	-1.375E+02	0.000E+00	30 39 no				
29	0.000E+00	-1.174E+02	0.000E+00	31 39 no				
28	0.000E+00	-1.202E+02	0.000E+00	31 40 no				
27	0.000E+00	-1.230E+02	0.000E+00	32 40 no				
26	0.000E+00	-1.202E+02	0.000E+00	32 41 no				
25	0.000E+00	-5.366E+03	0.000E+00	33 41 no				
24	0.000E+00	-1.375E+02	0.000E+00	33 42 no				
23	0.000E+00	-1.659E+02	0.000E+00	34 42 no				
22	0.000E+00	-1.788E+02	0.000E+00	35 42 no				
21	0.000E+00	-1.041E+04	0.000E+00	36 42 no				
20	0.000E+00	-1.788E+02	0.000E+00	37 42 no				
19	0.000E+00	-1.659E+02	0.000E+00	38 42 no				
18	0.000E+00	-1.375E+02	0.000E+00	39 42 no				
17	0.000E+00	-5.366E+03	0.000E+00	39 41 no				
16	0.000E+00	-1.202E+02	0.000E+00	40 41 no				
15	0.000E+00	-1.230E+02	0.000E+00	40 40 no				
14	0.000E+00	-1.202E+02	0.000E+00	41 40 no				
13	0.000E+00	-1.511E+04	9.085E+03	41 39 no				
12	0.000E+00	-1.513E+04	9.085E+03	42 39 no				
11	0.000E+00	-1.516E+04	9.085E+03	42 38 no				
10	0.000E+00	-1.788E+02	0.000E+00	42 37 no				
9	0.000E+00	-1.835E+02	0.000E+00	42 36 no				
8	0.000E+00	-1.788E+02	0.000E+00	42 35 no				
7	0.000E+00	-1.659E+02	0.000E+00	42 34 no				
6	0.000E+00	-1.375E+02	0.000E+00	42 33 no				
5	0.000E+00	-1.174E+02	0.000E+00	41 33 no				
4	0.000E+00	-1.202E+02	0.000E+00	41 32 no				
3	0.000E+00	-1.230E+02	0.000E+00	40 32 no				
2	0.000E+00	-1.202E+02	0.000E+00	40 31 no				
1	0.000E+00	-5.870E+01	0.000E+00	39 31 yes				

Structural element data ...

Elem	ID	Nod1	Nod2	Prop	F-shear	F-axial	Mom-1	Mom-2
48	1	48	1	3 beam	4.352E+03	-1.685E+04	1.749E+03	6.234E-05
47	1	47	48	3 beam	-2.327E+03	-4.802E+04	4.921E+02	-1.749E+03
46	1	46	47	3 beam	1.619E+03	-1.211E+05	1.457E+03	-4.923E+02
45	1	45	46	3 beam	8.959E+03	-1.896E+05	7.089E+03	-1.458E+03
44	1	44	45	3 beam	-6.443E+03	-2.038E+05	3.039E+03	-7.088E+03
43	1	43	44	3 beam	-9.190E+02	-1.411E+05	2.491E+03	-3.039E+03
42	1	42	43	3 beam	-4.028E+03	-4.895E+04	3.149E+02	-2.491E+03

41	1	41	42	3	beam	-7.839E+02	-1.633E+04	-2.540E-05	-3.151E+02
40	2	40	41	2	beam	2.307E+02	9.822E+03	9.271E+01	1.183E-05
39	2	39	40	2	beam	-2.562E+02	1.326E+04	-1.522E+01	-9.276E+01
38	2	38	39	2	beam	-2.671E+02	3.095E+04	-1.278E+02	1.521E+01
37	2	37	38	2	beam	6.654E+02	3.138E+04	1.397E+02	1.278E+02
36	2	36	37	2	beam	-8.577E+02	4.836E+04	-2.051E+02	-1.397E+02
35	2	35	36	2	beam	2.427E+02	5.474E+04	-7.394E+01	2.050E+02
34	2	34	35	2	beam	-6.132E+01	6.323E+04	-1.105E+02	7.394E+01
33	2	33	34	2	beam	-1.580E+01	6.861E+04	-1.205E+02	1.105E+02
32	2	32	33	2	beam	-1.504E+01	6.744E+04	-1.299E+02	1.204E+02
31	2	31	32	2	beam	1.854E+02	6.256E+04	-1.936E+01	1.299E+02
30	2	30	31	2	beam	-3.798E+02	5.309E+04	-2.245E+02	1.937E+01
29	2	29	30	2	beam	6.687E+02	4.811E+04	4.424E+01	2.245E+02
28	2	28	29	2	beam	-2.437E+02	3.595E+04	-5.376E+01	-4.420E+01
27	2	27	28	2	beam	2.800E+02	3.215E+04	6.420E+01	5.378E+01
26	2	26	27	2	beam	-3.392E+02	1.746E+04	-7.874E+01	-6.419E+01
25	2	25	26	2	beam	2.730E+02	1.780E+04	3.097E+01	7.875E+01
24	2	24	25	2	beam	4.905E+01	4.289E+03	5.071E+01	-3.099E+01
23	2	23	24	2	beam	-7.348E+01	-6.132E+02	1.104E+01	-5.074E+01
22	2	22	23	2	beam	2.579E+02	-1.302E+04	1.648E+02	-1.106E+01
21	2	21	22	2	beam	1.996E+02	-2.466E+04	2.902E+02	-1.648E+02
20	2	20	21	2	beam	-1.767E+02	-2.502E+04	1.792E+02	-2.902E+02
19	2	19	20	2	beam	-2.700E+02	-1.378E+04	1.819E+01	-1.792E+02
18	2	18	19	2	beam	7.496E+01	-1.087E+03	5.868E+01	-1.819E+01
17	2	17	18	2	beam	-1.819E+02	3.830E+03	-1.445E+01	-5.865E+01
16	2	16	17	2	beam	-7.518E+01	1.619E+04	-4.469E+01	1.447E+01
15	2	15	16	2	beam	6.914E+02	1.844E+04	2.467E+02	4.464E+01
14	2	14	15	2	beam	-2.978E+03	3.191E+04	-1.008E+03	-2.467E+02
13	2	13	14	2	beam	1.170E+04	3.297E+04	3.695E+03	1.008E+03
12	2	12	13	2	beam	2.476E+04	4.925E+04	4.562E+03	5.390E+03
11	2	11	12	2	beam	1.857E+04	5.252E+04	5.510E+03	4.523E+03
10	2	10	11	2	beam	7.311E+03	6.301E+04	7.827E+02	3.575E+03
9	2	9	10	2	beam	-1.818E+03	6.798E+04	-3.602E+02	-7.827E+02
8	2	8	9	2	beam	4.754E+02	6.833E+04	-6.137E+01	3.601E+02
7	2	7	8	2	beam	2.408E+01	6.391E+04	-4.703E+01	6.138E+01
6	2	6	7	2	beam	-3.960E+02	5.384E+04	-2.610E+02	4.706E+01
5	2	5	6	2	beam	1.119E+03	4.763E+04	1.889E+02	2.610E+02
4	2	4	5	2	beam	-8.466E+02	3.111E+04	-1.514E+02	-1.889E+02
3	2	3	4	2	beam	3.420E+02	3.044E+04	-7.293E+00	1.514E+02
2	2	2	3	2	beam	2.395E+02	1.206E+04	9.366E+01	7.255E+00
1	2	1	2	2	beam	-2.331E+02	1.043E+04	4.395E-06	-9.371E+01

Structural Properties ...

Prop Num.	Area	E	I	Dynamic Density	Plastic Moment
3	3.04800E-01	2.75800E+10	2.36000E-03	0.00000E+00	Not Set
2	3.78700E-03	1.64000E+11	1.72300E-05	0.00000E+00	Not Set
Prop. Num.	Cable Bond Stiffness	Cable Bond Strength	Yield Strength	Compressive Yield	Support Stiffness
3	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
2	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

set log off

log-file recording stopped 11-Aug-95 14:31

Title: ESF Ground Support - Structural Steel Analysis

Page: II-51 of II-62

STATION: TSW1 @ 18+00

LOADING: STATIC: DL+UTIL

STEEL SET: W6X20 @ 4'-0" O.C.

* FLAC log-file opened 11-Aug-95 14:23

From File : flac.ini

>res m18_k2.sav

e following state has been restored:

date	time	step	grid	version
8-Aug-95	11:16	5210	70 X 70	3.22

Title:

>pr stru

Structural node data ...

Node	X	Y	X-disp	Y-disp	Ang-disp	Xfix	Yfix	Rfix
48	1.704E+00	-3.408E+00	3.192E-05	7.437E-04	-9.968E-05	no	no	no
47	1.205E+00	-3.614E+00	1.753E-05	7.855E-04	-7.790E-05	no	no	no
46	6.264E-01	-3.758E+00	5.011E-06	8.302E-04	-6.525E-05	no	no	no
45	0.000E+00	-3.810E+00	-1.251E-06	8.509E-04	1.199E-07	no	no	no
44	-6.264E-01	-3.758E+00	-7.676E-06	8.304E-04	6.979E-05	no	no	no
43	-1.205E+00	-3.614E+00	-2.081E-05	7.814E-04	8.182E-05	no	no	no
42	-1.704E+00	-3.408E+00	-3.607E-05	7.387E-04	1.032E-04	no	no	no
41	-2.053E+00	-3.209E+00	-5.695E-05	6.941E-04	0.000E+00	no	no	no
40	-2.380E+00	-2.975E+00	-6.520E-05	6.420E-04	1.234E-04	no	no	no
39	-2.694E+00	-2.694E+00	-8.349E-05	5.853E-04	1.394E-04	no	no	no
38	-2.975E+00	-2.380E+00	-1.001E-04	5.172E-04	1.218E-04	no	no	no
37	-3.209E+00	-2.053E+00	-1.176E-04	4.598E-04	1.421E-04	no	no	no
36	-3.408E+00	-1.704E+00	-1.374E-04	3.692E-04	1.307E-04	no	no	no
35	-3.614E+00	-1.205E+00	-1.362E-04	2.633E-04	3.985E-05	no	no	no
34	-3.758E+00	-6.264E-01	-1.161E-04	1.093E-04	2.063E-05	no	no	no
33	-3.810E+00	0.000E+00	-1.061E-04	-9.443E-05	4.901E-07	no	no	no
32	-3.758E+00	6.264E-01	-1.165E-04	-2.953E-04	-2.018E-05	no	no	no
31	-3.614E+00	1.205E+00	-1.353E-04	-4.411E-04	-3.546E-05	no	no	no
30	-3.408E+00	1.704E+00	-1.349E-04	-5.415E-04	-1.394E-04	no	no	no
29	-3.209E+00	2.053E+00	-1.153E-04	-6.387E-04	-1.354E-04	no	no	no
28	-2.975E+00	2.380E+00	-1.008E-04	-6.894E-04	-1.160E-04	no	no	no
27	-2.694E+00	2.694E+00	-8.783E-05	-7.659E-04	-1.430E-04	no	no	no
26	-2.380E+00	2.975E+00	-7.077E-05	-8.217E-04	-1.230E-04	no	no	no
25	-2.053E+00	3.209E+00	-6.107E-05	-8.774E-04	-1.246E-04	no	no	no
24	-1.704E+00	3.408E+00	-4.947E-05	-9.259E-04	-1.210E-04	no	no	no
23	-1.205E+00	3.614E+00	-3.586E-05	-9.886E-04	-9.684E-05	no	no	no
22	-6.264E-01	3.758E+00	-1.975E-05	-1.034E-03	-9.291E-05	no	no	no
21	0.000E+00	3.810E+00	-2.681E-07	-1.083E-03	-1.005E-05	no	no	no
20	6.264E-01	3.758E+00	1.984E-05	-1.040E-03	1.021E-04	no	no	no
19	1.205E+00	3.614E+00	3.584E-05	-9.845E-04	1.036E-04	no	no	no
18	1.704E+00	3.408E+00	4.790E-05	-9.238E-04	1.181E-04	no	no	no
17	2.053E+00	3.209E+00	6.050E-05	-8.751E-04	1.272E-04	no	no	no
16	2.380E+00	2.975E+00	6.998E-05	-8.201E-04	1.166E-04	no	no	no
15	2.694E+00	2.694E+00	8.604E-05	-7.650E-04	1.501E-04	no	no	no
14	2.975E+00	2.380E+00	9.718E-05	-6.899E-04	7.139E-05	no	no	no
13	3.209E+00	2.053E+00	1.133E-04	-6.409E-04	2.886E-04	no	no	no
12	3.408E+00	1.704E+00	1.349E-04	-5.404E-04	2.453E-04	no	no	no
11	3.614E+00	1.205E+00	1.386E-04	-4.393E-04	2.560E-04	no	no	no
10	3.758E+00	6.264E-01	1.208E-04	-2.930E-04	-4.138E-05	no	no	no
9	3.810E+00	0.000E+00	1.079E-04	-9.282E-05	1.350E-05	no	no	no
8	3.758E+00	-6.264E-01	1.184E-04	1.103E-04	-2.456E-05	no	no	no
7	3.614E+00	-1.205E+00	1.383E-04	2.643E-04	-3.588E-05	no	no	no
6	3.408E+00	-1.704E+00	1.403E-04	3.696E-04	-1.364E-04	no	no	no
5	3.209E+00	-2.053E+00	1.182E-04	4.644E-04	-1.499E-04	no	no	no
4	2.975E+00	-2.380E+00	9.944E-05	5.228E-04	-1.311E-04	no	no	no
3	2.694E+00	-2.694E+00	8.039E-05	5.952E-04	-1.445E-04	no	no	no
2	2.380E+00	-2.975E+00	6.312E-05	6.520E-04	-1.191E-04	no	no	no

Title: ESF Ground Support - Structural Steel Analysis

Node	1	2.053E+00	-3.209E+00	5.266E-05	7.019E-04	0.000E+00	no	no	no
		X-load	Y-load	Moment	i j Pin	Sh. force	Angle	Bond	
48	0.000E+00	0.000E+00	0.000E+00	0.000E+00	39 30 no				
47	0.000E+00	0.000E+00	0.000E+00	0.000E+00	38 30 no				
46	0.000E+00	0.000E+00	0.000E+00	0.000E+00	37 30 no				
45	0.000E+00	0.000E+00	0.000E+00	0.000E+00	36 30 no				
44	0.000E+00	0.000E+00	0.000E+00	0.000E+00	35 30 no				
43	0.000E+00	0.000E+00	0.000E+00	0.000E+00	34 30 no				
42	0.000E+00	0.000E+00	0.000E+00	0.000E+00	33 30 no				
41	0.000E+00	-5.870E+01	0.000E+00	0.000E+00	33 31 yes				
40	0.000E+00	-1.321E+03	0.000E+00	0.000E+00	32 31 no				
39	0.000E+00	-2.925E+03	0.000E+00	0.000E+00	32 32 no				
38	0.000E+00	-2.922E+03	0.000E+00	0.000E+00	31 32 no				
37	0.000E+00	-1.174E+02	0.000E+00	0.000E+00	31 33 no				
36	0.000E+00	-1.375E+02	0.000E+00	0.000E+00	30 33 no				
35	0.000E+00	-1.659E+02	0.000E+00	0.000E+00	30 34 no				
34	0.000E+00	-1.788E+02	0.000E+00	0.000E+00	30 35 no				
33	0.000E+00	-1.835E+02	0.000E+00	0.000E+00	30 36 no				
32	0.000E+00	-1.788E+02	0.000E+00	0.000E+00	30 37 no				
31	0.000E+00	-1.659E+02	0.000E+00	0.000E+00	30 38 no				
30	0.000E+00	-1.375E+02	0.000E+00	0.000E+00	30 39 no				
29	0.000E+00	-1.174E+02	0.000E+00	0.000E+00	31 39 no				
28	0.000E+00	-1.202E+02	0.000E+00	0.000E+00	31 40 no				
27	0.000E+00	-1.230E+02	0.000E+00	0.000E+00	32 40 no				
26	0.000E+00	-1.202E+02	0.000E+00	0.000E+00	32 41 no				
25	0.000E+00	-5.366E+03	0.000E+00	0.000E+00	33 41 no				
24	0.000E+00	-1.375E+02	0.000E+00	0.000E+00	33 42 no				
23	0.000E+00	-1.659E+02	0.000E+00	0.000E+00	34 42 no				
22	0.000E+00	-1.788E+02	0.000E+00	0.000E+00	35 42 no				
21	0.000E+00	-1.041E+04	0.000E+00	0.000E+00	36 42 no				
20	0.000E+00	-1.788E+02	0.000E+00	0.000E+00	37 42 no				
19	0.000E+00	-1.659E+02	0.000E+00	0.000E+00	38 42 no				
18	0.000E+00	-1.375E+02	0.000E+00	0.000E+00	39 42 no				
17	0.000E+00	-5.366E+03	0.000E+00	0.000E+00	39 41 no				
16	0.000E+00	-1.202E+02	0.000E+00	0.000E+00	40 41 no				
15	0.000E+00	-1.230E+02	0.000E+00	0.000E+00	40 40 no				
14	0.000E+00	-1.202E+02	0.000E+00	0.000E+00	41 40 no				
13	0.000E+00	-1.511E+04	9.085E+03	41 39 no					
12	0.000E+00	-1.513E+04	9.085E+03	42 39 no					
11	0.000E+00	-1.516E+04	9.085E+03	42 38 no					
10	0.000E+00	-1.788E+02	0.000E+00	42 37 no					
9	0.000E+00	-1.835E+02	0.000E+00	42 36 no					
8	0.000E+00	-1.788E+02	0.000E+00	42 35 no					
7	0.000E+00	-1.659E+02	0.000E+00	42 34 no					
6	0.000E+00	-1.375E+02	0.000E+00	42 33 no					
5	0.000E+00	-1.174E+02	0.000E+00	41 33 no					
4	0.000E+00	-1.202E+02	0.000E+00	41 32 no					
3	0.000E+00	-1.230E+02	0.000E+00	40 32 no					
2	0.000E+00	-1.202E+02	0.000E+00	40 31 no					
1	0.000E+00	-5.870E+01	0.000E+00	39 31 yes					

Structural element data ...

Elem	ID	Nod1	Nod2	Prop	F-shear	F-axial	Mom-1	Mom-2
48	1	48	1	3	beam	1.645E+04	4.356E+04	6.611E+03
47	1	47	48	3	beam	-1.476E+04	4.555E+04	-1.362E+03
46	1	46	47	3	beam	9.212E+03	-3.098E+04	4.127E+03
45	1	45	46	3	beam	8.416E+03	-5.682E+04	9.414E+03
44	1	44	45	3	beam	-6.996E+03	-5.556E+04	5.016E+03
43	1	43	44	3	beam	-1.243E+04	-2.457E+04	-2.391E+03
42	1	42	43	3	beam	1.841E+04	4.486E+04	7.554E+03

41	1	41	42	3	beam	-1.879E+04	4.925E+04	1.211E-04	-7.553E+03
40	2	40	41	2	beam	1.172E+02	3.892E+04	4.709E+01	1.409E-05
39	2	39	40	2	beam	2.833E+02	3.647E+04	1.666E+02	-4.724E+01
38	2	38	39	2	beam	-1.352E+03	5.880E+04	-4.031E+02	-1.667E+02
37	2	37	38	2	beam	2.720E+03	5.640E+04	6.901E+02	4.034E+02
36	2	36	37	2	beam	-3.835E+03	1.068E+05	-8.513E+02	-6.901E+02
35	2	35	36	2	beam	1.392E+03	1.147E+05	-9.922E+01	8.511E+02
34	2	34	35	2	beam	2.748E+01	1.607E+05	-8.294E+01	9.932E+01
33	2	33	34	2	beam	-2.416E+01	2.021E+05	-9.813E+01	8.294E+01
32	2	32	33	2	beam	1.659E+01	1.992E+05	-8.770E+01	9.813E+01
31	2	31	32	2	beam	5.135E+01	1.532E+05	-5.714E+01	8.775E+01
30	2	30	31	2	beam	-1.802E+03	1.062E+05	-1.031E+03	5.718E+01
29	2	29	30	2	beam	5.268E+03	1.165E+05	1.087E+03	1.030E+03
28	2	28	29	2	beam	-4.729E+03	5.092E+04	-8.138E+02	-1.087E+03
27	2	27	28	2	beam	3.004E+03	7.170E+04	4.518E+02	8.139E+02
26	2	26	27	2	beam	-1.511E+03	3.734E+04	-1.846E+02	-4.519E+02
25	2	25	26	2	beam	8.653E+02	3.661E+04	1.633E+02	1.846E+02
24	2	24	25	2	beam	-6.877E+02	2.209E+04	-1.133E+02	-1.631E+02
23	2	23	24	2	beam	8.893E+02	1.310E+04	3.667E+02	1.137E+02
22	2	22	23	2	beam	-1.168E+03	-4.622E+03	-3.294E+02	-3.667E+02
21	2	21	22	2	beam	2.233E+03	-1.524E+04	1.074E+03	3.293E+02
20	2	20	21	2	beam	-1.815E+03	-1.615E+04	-6.607E+01	-1.074E+03
19	2	19	20	2	beam	2.466E+02	-2.000E+03	8.075E+01	6.622E+01
18	2	18	19	2	beam	-1.867E+01	1.355E+04	7.063E+01	-8.071E+01
17	2	17	18	2	beam	-3.371E+01	2.080E+04	5.712E+01	-7.067E+01
16	2	16	17	2	beam	-6.536E+02	3.680E+04	-2.057E+02	-5.697E+01
15	2	15	16	2	beam	2.041E+03	3.775E+04	6.544E+02	2.056E+02
14	2	14	15	2	beam	-5.610E+03	7.192E+04	-1.709E+03	-6.545E+02
13	2	13	14	2	beam	1.610E+04	4.742E+04	4.763E+03	1.710E+03
12	2	12	13	2	beam	1.999E+04	1.191E+05	3.714E+03	4.322E+03
11	2	11	12	2	beam	2.009E+04	1.056E+05	5.483E+03	5.371E+03
10	2	10	11	2	beam	7.356E+03	1.535E+05	7.824E+02	3.602E+03
9	2	9	10	2	beam	-1.704E+03	1.988E+05	-2.888E+02	-7.822E+02
8	2	8	9	2	beam	3.745E+02	2.018E+05	-5.344E+01	2.888E+02
7	2	7	8	2	beam	-8.566E-01	1.608E+05	-5.389E+01	5.338E+01
6	2	6	7	2	beam	-1.747E+03	1.140E+05	-9.977E+02	5.386E+01
5	2	5	6	2	beam	4.490E+03	1.112E+05	8.070E+02	9.977E+02
4	2	4	5	2	beam	-3.356E+03	5.675E+04	-5.420E+02	-8.069E+02
3	2	3	4	2	beam	2.146E+03	6.081E+04	3.621E+02	5.420E+02
2	2	2	3	2	beam	-9.113E+02	3.770E+04	-2.161E+01	-3.624E+02
1	2	1	2	2	beam	5.369E+01	3.370E+04	4.256E-06	2.158E+01

Structural Properties ...

Prop Num.	Area	E	I	Dynamic Density	Plastic Moment
3	3.04800E-01	2.75800E+10	2.36000E-03	0.00000E+00	Not Set
2	3.78700E-03	1.64000E+11	1.72300E-05	0.00000E+00	Not Set
Prop. Num.	Cable Bond Stiffness	Cable Bond Strength	Yield Strength	Compressive Yield	Support Stiffness
3	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
2	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

set log off

log-file recording stopped 11-Aug-95 14:24

STATION: TSW2 @ 27+00

LOADING: STATIC: DL+UTIL

STEEL SET: W6X20 @ 4'-0" O.C.

* FLAC log-file opened 11-Aug-95 14:24

From File : flac.ini

>res m27_k2.sav

a following state has been restored:

date	time	step	grid	version
8-Aug-95	11:40	5210	70 X 70	3.22

Title:

>pr stru

Structural node data ...

Node	X	Y	X-disp	Y-disp	Ang-disp	Xfix	Yfix	Rfix
48	1.704E+00	-3.408E+00	1.471E-04	1.053E-03	-2.200E-04	no	no	no
47	1.205E+00	-3.614E+00	9.827E-05	1.149E-03	-1.854E-04	no	no	no
46	6.264E-01	-3.758E+00	4.858E-05	1.244E-03	-1.820E-04	no	no	no
45	0.000E+00	-3.810E+00	-1.381E-06	1.316E-03	-5.148E-06	no	no	no
44	-6.264E-01	-3.758E+00	-5.121E-05	1.246E-03	1.846E-04	no	no	no
43	-1.205E+00	-3.614E+00	-1.018E-04	1.148E-03	1.903E-04	no	no	no
42	-1.704E+00	-3.408E+00	-1.500E-04	1.051E-03	2.233E-04	no	no	no
41	-2.053E+00	-3.209E+00	-2.002E-04	9.672E-04	0.000E+00	no	no	no
40	-2.380E+00	-2.975E+00	-2.322E-04	8.653E-04	2.454E-04	no	no	no
39	-2.694E+00	-2.694E+00	-2.714E-04	7.636E-04	2.530E-04	no	no	no
38	-2.975E+00	-2.380E+00	-3.053E-04	6.408E-04	2.296E-04	no	no	no
37	-3.209E+00	-2.053E+00	-3.378E-04	5.396E-04	2.257E-04	no	no	no
36	-3.408E+00	-1.704E+00	-3.693E-04	3.995E-04	2.251E-04	no	no	no
35	-3.614E+00	-1.205E+00	-4.030E-04	2.352E-04	1.420E-04	no	no	no
34	-3.758E+00	-6.264E-01	-4.261E-04	4.360E-05	8.076E-05	no	no	no
33	-3.810E+00	0.000E+00	-4.320E-04	-1.739E-04	1.846E-07	no	no	no
32	-3.758E+00	6.264E-01	-4.255E-04	-3.857E-04	-7.822E-05	no	no	no
31	-3.614E+00	1.205E+00	-4.054E-04	-5.794E-04	-1.387E-04	no	no	no
30	-3.408E+00	1.704E+00	-3.757E-04	-7.400E-04	-2.033E-04	no	no	no
29	-3.209E+00	2.053E+00	-3.455E-04	-8.700E-04	-2.281E-04	no	no	no
28	-2.975E+00	2.380E+00	-3.142E-04	-9.807E-04	-2.318E-04	no	no	no
27	-2.694E+00	2.694E+00	-2.816E-04	-1.095E-03	-2.392E-04	no	no	no
26	-2.380E+00	2.975E+00	-2.404E-04	-1.190E-03	-2.443E-04	no	no	no
25	-2.053E+00	3.209E+00	-2.110E-04	-1.291E-03	-2.330E-04	no	no	no
24	-1.704E+00	3.408E+00	-1.733E-04	-1.369E-03	-2.086E-04	no	no	no
23	-1.205E+00	3.614E+00	-1.329E-04	-1.473E-03	-1.951E-04	no	no	no
22	-6.264E-01	3.758E+00	-7.694E-05	-1.572E-03	-1.697E-04	no	no	no
21	0.000E+00	3.810E+00	-3.057E-06	-1.625E-03	-5.893E-06	no	no	no
20	6.264E-01	3.758E+00	7.174E-05	-1.579E-03	1.653E-04	no	no	no
19	1.205E+00	3.614E+00	1.277E-04	-1.481E-03	1.898E-04	no	no	no
18	1.704E+00	3.408E+00	1.690E-04	-1.380E-03	2.128E-04	no	no	no
17	2.053E+00	3.209E+00	2.081E-04	-1.299E-03	2.350E-04	no	no	no
16	2.380E+00	2.975E+00	2.383E-04	-1.201E-03	2.405E-04	no	no	no
15	2.694E+00	2.694E+00	2.792E-04	-1.101E-03	2.611E-04	no	no	no
14	2.975E+00	2.380E+00	3.120E-04	-9.839E-04	1.841E-04	no	no	no
13	3.209E+00	2.053E+00	3.424E-04	-8.781E-04	3.819E-04	no	no	no
12	3.408E+00	1.704E+00	3.759E-04	-7.407E-04	3.156E-04	no	no	no
11	3.614E+00	1.205E+00	4.059E-04	-5.784E-04	3.482E-04	no	no	no
10	3.758E+00	6.264E-01	4.251E-04	-3.900E-04	1.860E-05	no	no	no
9	3.810E+00	0.000E+00	4.313E-04	-1.730E-04	1.669E-05	no	no	no
8	3.758E+00	-6.264E-01	4.265E-04	4.476E-05	-8.147E-05	no	no	no
7	3.614E+00	-1.205E+00	4.058E-04	2.369E-04	-1.403E-04	no	no	no
6	3.408E+00	-1.704E+00	3.732E-04	4.050E-04	-2.241E-04	no	no	no
5	3.209E+00	-2.053E+00	3.413E-04	5.437E-04	-2.277E-04	no	no	no
4	2.975E+00	-2.380E+00	3.080E-04	6.471E-04	-2.356E-04	no	no	no
3	2.694E+00	-2.694E+00	2.712E-04	7.705E-04	-2.533E-04	no	no	no
2	2.380E+00	-2.975E+00	2.301E-04	8.669E-04	-2.471E-04	no	no	no

Title: ESF Ground Support - Structural Steel Analysis

Node	X-load	Y-load	Moment	i	j	Pin	Sh. force	Angle	Bond
1	2.053E+00	-3.209E+00	1.957E-04	9.720E-04	0.000E+00	no	no	no	
48	0.000E+00	0.000E+00	0.000E+00	39	30	no			
47	0.000E+00	0.000E+00	0.000E+00	38	30	no			
46	0.000E+00	0.000E+00	0.000E+00	37	30	no			
45	0.000E+00	0.000E+00	0.000E+00	36	30	no			
44	0.000E+00	0.000E+00	0.000E+00	35	30	no			
43	0.000E+00	0.000E+00	0.000E+00	34	30	no			
42	0.000E+00	0.000E+00	0.000E+00	33	30	no			
41	0.000E+00	-5.870E+01	0.000E+00	33	31	yes			
40	0.000E+00	-1.321E+03	0.000E+00	32	31	no			
39	0.000E+00	-2.925E+03	0.000E+00	32	32	no			
38	0.000E+00	-2.922E+03	0.000E+00	31	32	no			
37	0.000E+00	-1.174E+02	0.000E+00	31	33	no			
36	0.000E+00	-1.375E+02	0.000E+00	30	33	no			
35	0.000E+00	-1.659E+02	0.000E+00	30	34	no			
34	0.000E+00	-1.788E+02	0.000E+00	30	35	no			
33	0.000E+00	-1.835E+02	0.000E+00	30	36	no			
32	0.000E+00	-1.788E+02	0.000E+00	30	37	no			
31	0.000E+00	-1.659E+02	0.000E+00	30	38	no			
30	0.000E+00	-1.375E+02	0.000E+00	30	39	no			
29	0.000E+00	-1.174E+02	0.000E+00	31	39	no			
28	0.000E+00	-1.202E+02	0.000E+00	31	40	no			
27	0.000E+00	-1.230E+02	0.000E+00	32	40	no			
26	0.000E+00	-1.202E+02	0.000E+00	32	41	no			
25	0.000E+00	-5.366E+03	0.000E+00	33	41	no			
24	0.000E+00	-1.375E+02	0.000E+00	33	42	no			
23	0.000E+00	-1.659E+02	0.000E+00	34	42	no			
22	0.000E+00	-1.788E+02	0.000E+00	35	42	no			
21	0.000E+00	-1.041E+04	0.000E+00	36	42	no			
20	0.000E+00	-1.788E+02	0.000E+00	37	42	no			
19	0.000E+00	-1.659E+02	0.000E+00	38	42	no			
18	0.000E+00	-1.375E+02	0.000E+00	39	42	no			
17	0.000E+00	-5.366E+03	0.000E+00	39	41	no			
16	0.000E+00	-1.202E+02	0.000E+00	40	41	no			
15	0.000E+00	-1.230E+02	0.000E+00	40	40	no			
14	0.000E+00	-1.202E+02	0.000E+00	41	40	no			
13	0.000E+00	-1.511E+04	9.085E+03	41	39	no			
12	0.000E+00	-1.513E+04	9.085E+03	42	39	no			
11	0.000E+00	-1.516E+04	9.085E+03	42	38	no			
10	0.000E+00	-1.788E+02	0.000E+00	42	37	no			
9	0.000E+00	-1.835E+02	0.000E+00	42	36	no			
8	0.000E+00	-1.788E+02	0.000E+00	42	35	no			
7	0.000E+00	-1.659E+02	0.000E+00	42	34	no			
6	0.000E+00	-1.375E+02	0.000E+00	42	33	no			
5	0.000E+00	-1.174E+02	0.000E+00	41	33	no			
4	0.000E+00	-1.202E+02	0.000E+00	41	32	no			
3	0.000E+00	-1.230E+02	0.000E+00	40	32	no			
2	0.000E+00	-1.202E+02	0.000E+00	40	31	no			
1	0.000E+00	-5.870E+01	0.000E+00	39	31	yes			

Structural element data ...

Element data ...						F-shear	F-axial	Mom-1	Mom-2
Elem ID	Nod1	Nod2	Prop						
48	1	48	1	3	beam	2.040E+04	-2.092E+04	8.201E+03	2.263E-05
47	1	47	43	3	beam	-1.491E+04	-1.307E+05	1.464E+02	-8.202E+03
46	1	46	47	3	beam	7.590E+02	-3.389E+05	5.993E+02	-1.469E+02
45	1	45	46	3	beam	5.638E+04	-6.023E+05	3.603E+04	-5.970E+02
44	1	44	45	3	beam	-5.213E+04	-6.055E+05	3.265E+03	-3.603E+04
43	1	43	44	3	beam	-8.864E+03	-3.460E+05	-2.018E+03	-3.266E+03
42	1	42	43	3	beam	2.221E+04	-1.157E+05	9.979E+03	2.019E+03

Title: ESE Ground Support - Structural Steel Analysis

41	1	41	42	3	beam	-2.483E+04	-2.027E+04	5.002E-04	-9.979E+03
40	2	40	41	2	beam	-8.040E+02	5.721E+04	-3.232E+02	-1.031E-05
39	2	39	40	2	beam	1.776E+03	5.546E+04	4.253E+02	3.233E+02
38	2	38	39	2	beam	-2.762E+03	1.014E+05	-7.386E+02	-4.251E+02
37	2	37	38	2	beam	3.538E+03	9.945E+04	6.833E+02	7.387E+02
36	2	36	37	2	beam	-3.423E+03	1.639E+05	-6.922E+02	-6.836E+02
35	2	35	36	2	beam	9.537E+02	1.580E+05	-1.770E+02	6.922E+02
34	2	34	35	2	beam	-3.798E+02	1.910E+05	-4.034E+02	1.770E+02
33	2	33	34	2	beam	1.309E+02	2.150E+05	-3.211E+02	4.034E+02
32	2	32	33	2	beam	-9.939E+01	2.089E+05	-3.837E+02	3.213E+02
31	2	31	32	2	beam	3.250E+02	1.916E+05	-1.901E+02	3.838E+02
30	2	30	31	2	beam	-5.466E+02	1.594E+05	-4.852E+02	1.900E+02
29	2	29	30	2	beam	1.542E+03	1.496E+05	1.352E+02	4.847E+02
28	2	28	29	2	beam	-8.025E+02	1.128E+05	-1.872E+02	-1.353E+02
27	2	27	28	2	beam	6.548E+02	9.421E+04	8.851E+01	1.874E+02
26	2	26	27	2	beam	-5.823E+02	4.904E+04	-1.568E+02	-8.852E+01
25	2	25	26	2	beam	1.176E+03	5.298E+04	3.162E+02	1.566E+02
24	2	24	25	2	beam	-7.169E+02	9.906E+03	2.739E+01	-3.155E+02
23	2	23	24	2	beam	1.614E+02	2.604E+03	1.139E+02	-2.671E+01
22	2	22	23	2	beam	2.263E+01	-3.238E+04	1.275E+02	-1.140E+02
21	2	21	22	2	beam	1.937E+03	-6.791E+04	1.345E+03	-1.277E+02
20	2	20	21	2	beam	-1.831E+03	-6.873E+04	1.944E+02	-1.345E+03
19	2	19	20	2	beam	-2.616E+02	-3.249E+04	3.805E+01	-1.940E+02
18	2	18	19	2	beam	3.055E+02	2.172E+02	2.031E+02	-3.810E+01
17	2	17	18	2	beam	-2.330E+02	9.407E+03	1.094E+02	-2.030E+02
16	2	16	17	2	beam	-3.534E+02	4.982E+04	-3.300E+01	-1.090E+02
15	2	15	16	2	beam	8.122E+02	5.474E+04	3.092E+02	3.303E+01
14	2	14	15	2	beam	-3.921E+03	9.601E+04	-1.342E+03	-3.100E+02
13	2	13	14	2	beam	1.360E+04	1.083E+05	4.123E+03	1.342E+03
12	2	12	13	2	beam	2.237E+04	1.593E+05	4.030E+03	4.962E+03
11	2	11	12	2	beam	1.935E+04	1.582E+05	5.396E+03	5.055E+03
10	2	10	11	2	beam	7.133E+03	1.881E+05	5.633E+02	3.688E+03
9	2	9	10	2	beam	-1.820E+03	2.132E+05	-5.804E+02	-5.632E+02
8	2	8	9	2	beam	4.418E+02	2.150E+05	-3.025E+02	5.802E+02
7	2	7	8	2	beam	7.897E+01	1.913E+05	-2.555E+02	3.025E+02
6	2	6	7	2	beam	-6.758E+02	1.645E+05	-6.205E+02	2.554E+02
5	2	5	6	2	beam	2.958E+03	1.620E+05	5.687E+02	6.204E+02
4	2	4	5	2	beam	-3.103E+03	1.013E+05	-6.789E+02	-5.686E+02
3	2	3	4	2	beam	2.658E+03	9.849E+04	4.412E+02	6.787E+02
2	2	2	3	2	beam	-1.897E+03	4.989E+04	-3.584E+02	-4.412E+02
1	2	1	2	2	beam	8.914E+02	5.366E+04	2.011E-05	3.583E+02

Structural Properties ...

Prop Num.	Area	E	I	Dynamic Density	Plastic Moment
3	3.04800E-01	2.75800E+10	2.36000E-03	0.00000E+00	Not Set
2	3.78700E-03	1.64000E+11	1.72300E-05	0.00000E+00	Not Set
Prop. Num.	Cable Bond Stiffness	Cable Bond Strength	Yield Strength	Compressive Yield	Support Stiffness
3	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
2	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

set log off

log-file recording stopped 11-Aug-95 14:24

Title: ESF Ground Support - Structural Steel Analysis

STATION: TSW2 @ 34+00

LOADING: STATIC: DL+UTIL

STEEL SET: W6X20 @ 4'-0" O.C.

* FLAC log-file opened 11-Aug-95 14:24

From File : flac.ini

>res m34_k2.sav

a following state has been restored:

date	time	step	grid	version
8-Aug-95	12:04	5210	70 X 70	3.22

Title:

>pr stru

Structural node data ...

Node	X	Y	X-disp	Y-disp	Ang-disp	Xfix	Yfix	Rfix
48	1.704E+00	-3.408E+00	1.441E-04	1.093E-03	-2.515E-04	no	no	no
47	1.205E+00	-3.614E+00	8.922E-05	1.211E-03	-2.180E-04	no	no	no
46	6.264E-01	-3.758E+00	3.737E-05	1.303E-03	-1.049E-04	no	no	no
45	0.000E+00	-3.810E+00	-9.367E-06	1.315E-03	5.615E-05	no	no	no
44	-6.264E-01	-3.758E+00	-5.336E-05	1.242E-03	1.727E-04	no	no	no
43	-1.205E+00	-3.614E+00	-1.013E-04	1.126E-03	2.243E-04	no	no	no
42	-1.704E+00	-3.408E+00	-1.504E-04	1.015E-03	2.292E-04	no	no	no
41	-2.053E+00	-3.209E+00	-1.957E-04	9.329E-04	0.000E+00	no	no	no
40	-2.380E+00	-2.975E+00	-2.288E-04	8.273E-04	2.504E-04	no	no	no
39	-2.694E+00	-2.694E+00	-2.722E-04	7.278E-04	2.598E-04	no	no	no
38	-2.975E+00	-2.380E+00	-3.116E-04	6.053E-04	2.408E-04	no	no	no
37	-3.209E+00	-2.053E+00	-3.474E-04	5.012E-04	2.347E-04	no	no	no
36	-3.408E+00	-1.704E+00	-3.809E-04	3.642E-04	2.253E-04	no	no	no
35	-3.614E+00	-1.205E+00	-4.145E-04	1.979E-04	1.430E-04	no	no	no
34	-3.758E+00	-6.264E-01	-4.375E-04	3.843E-06	8.348E-05	no	no	no
33	-3.810E+00	0.000E+00	-4.478E-04	-2.182E-04	1.055E-05	no	no	no
32	-3.758E+00	6.264E-01	-4.467E-04	-4.435E-04	-7.992E-05	no	no	no
31	-3.614E+00	1.205E+00	-4.261E-04	-6.486E-04	-1.423E-04	no	no	no
30	-3.408E+00	1.704E+00	-3.959E-04	-8.148E-04	-2.228E-04	no	no	no
29	-3.209E+00	2.053E+00	-3.625E-04	-9.615E-04	-2.501E-04	no	no	no
28	-2.975E+00	2.380E+00	-3.302E-04	-1.078E-03	-2.390E-04	no	no	no
27	-2.694E+00	2.694E+00	-2.988E-04	-1.200E-03	-2.488E-04	no	no	no
26	-2.380E+00	2.975E+00	-2.598E-04	-1.306E-03	-2.692E-04	no	no	no
25	-2.053E+00	3.209E+00	-2.304E-04	-1.426E-03	-2.737E-04	no	no	no
24	-1.704E+00	3.408E+00	-1.911E-04	-1.518E-03	-2.336E-04	no	no	no
23	-1.205E+00	3.614E+00	-1.501E-04	-1.634E-03	-2.366E-04	no	no	no
22	-6.264E-01	3.758E+00	-8.510E-05	-1.766E-03	-1.968E-04	no	no	no
21	0.000E+00	3.810E+00	-4.011E-06	-1.816E-03	-1.336E-05	no	no	no
20	6.264E-01	3.758E+00	7.888E-05	-1.781E-03	1.803E-04	no	no	no
19	1.205E+00	3.614E+00	1.471E-04	-1.655E-03	2.347E-04	no	no	no
18	1.704E+00	3.408E+00	1.917E-04	-1.540E-03	2.352E-04	no	no	no
17	2.053E+00	3.209E+00	2.317E-04	-1.448E-03	2.809E-04	no	no	no
16	2.380E+00	2.975E+00	2.620E-04	-1.322E-03	2.786E-04	no	no	no
15	2.694E+00	2.694E+00	3.002E-04	-1.208E-03	2.763E-04	no	no	no
14	2.975E+00	2.380E+00	3.307E-04	-1.077E-03	1.947E-04	no	no	no
13	3.209E+00	2.053E+00	3.616E-04	-9.651E-04	4.023E-04	no	no	no
12	3.408E+00	1.704E+00	3.973E-04	-8.086E-04	3.370E-04	no	no	no
11	3.614E+00	1.205E+00	4.258E-04	-6.364E-04	3.487E-04	no	no	no
10	3.758E+00	6.264E-01	4.429E-04	-4.344E-04	1.812E-05	no	no	no
9	3.810E+00	0.000E+00	4.452E-04	-2.059E-04	1.093E-05	no	no	no
8	3.758E+00	-6.264E-01	4.380E-04	2.091E-05	-8.338E-05	no	no	no
7	3.614E+00	-1.205E+00	4.184E-04	2.197E-04	-1.439E-04	no	no	no
6	3.408E+00	-1.704E+00	3.850E-04	3.931E-04	-2.294E-04	no	no	no
5	3.209E+00	-2.053E+00	3.507E-04	5.349E-04	-2.441E-04	no	no	no
4	2.975E+00	-2.380E+00	3.145E-04	6.493E-04	-2.620E-04	no	no	no
3	2.694E+00	-2.694E+00	2.754E-04	7.863E-04	-2.745E-04	no	no	no
2	2.380E+00	-2.975E+00	2.328E-04	8.923E-04	-2.647E-04	no	no	no

Node	X-load	Y-load	Moment	i	j	Pin	Sh. force	Angle	Bond
1	2.053E+00	-3.209E+00	1.962E-04	1.005E-03	0.000E+00	no	no	no	
48	0.000E+00	0.000E+00	0.000E+00	39	30	no			
47	0.000E+00	0.000E+00	0.000E+00	38	30	no			
46	0.000E+00	0.000E+00	0.000E+00	37	30	no			
45	0.000E+00	0.000E+00	0.000E+00	36	30	no			
44	0.000E+00	0.000E+00	0.000E+00	35	30	no			
43	0.000E+00	0.000E+00	0.000E+00	34	30	no			
42	0.000E+00	0.000E+00	0.000E+00	33	30	no			
41	0.000E+00	-5.870E+01	0.000E+00	33	31	yes			
40	0.000E+00	-1.321E+03	0.000E+00	32	31	no			
39	0.000E+00	-2.925E+03	0.000E+00	32	32	no			
38	0.000E+00	-2.922E+03	0.000E+00	31	32	no			
37	0.000E+00	-1.174E+02	0.000E+00	31	33	no			
36	0.000E+00	-1.375E+02	0.000E+00	30	33	no			
35	0.000E+00	-1.659E+02	0.000E+00	30	34	no			
34	0.000E+00	-1.788E+02	0.000E+00	30	35	no			
33	0.000E+00	-1.835E+02	0.000E+00	30	36	no			
32	0.000E+00	-1.788E+02	0.000E+00	30	37	no			
31	0.000E+00	-1.659E+02	0.000E+00	30	38	no			
30	0.000E+00	-1.375E+02	0.000E+00	30	39	no			
29	0.000E+00	-1.174E+02	0.000E+00	31	39	no			
28	0.000E+00	-1.202E+02	0.000E+00	31	40	no			
27	0.000E+00	-1.230E+02	0.000E+00	32	40	no			
26	0.000E+00	-1.202E+02	0.000E+00	32	41	no			
25	0.000E+00	-5.366E+03	0.000E+00	33	41	no			
24	0.000E+00	-1.375E+02	0.000E+00	33	42	no			
23	0.000E+00	-1.659E+02	0.000E+00	34	42	no			
22	0.000E+00	-1.788E+02	0.000E+00	35	42	no			
21	0.000E+00	-1.041E+04	0.000E+00	36	42	no			
20	0.000E+00	-1.788E+02	0.000E+00	37	42	no			
19	0.000E+00	-1.659E+02	0.000E+00	38	42	no			
18	0.000E+00	-1.375E+02	0.000E+00	39	42	no			
17	0.000E+00	-5.366E+03	0.000E+00	39	41	no			
16	0.000E+00	-1.202E+02	0.000E+00	40	41	no			
15	0.000E+00	-1.230E+02	0.000E+00	40	40	no			
14	0.000E+00	-1.202E+02	0.000E+00	41	40	no			
13	0.000E+00	-1.511E+04	9.085E+03	41	39	no			
12	0.000E+00	-1.513E+04	9.085E+03	42	39	no			
11	0.000E+00	-1.516E+04	9.085E+03	42	38	no			
10	0.000E+00	-1.788E+02	0.000E+00	42	37	no			
9	0.000E+00	-1.835E+02	0.000E+00	42	36	no			
8	0.000E+00	-1.788E+02	0.000E+00	42	35	no			
7	0.000E+00	-1.659E+02	0.000E+00	42	34	no			
6	0.000E+00	-1.375E+02	0.000E+00	42	33	no			
5	0.000E+00	-1.174E+02	0.000E+00	41	33	no			
4	0.000E+00	-1.202E+02	0.000E+00	41	32	no			
3	0.000E+00	-1.230E+02	0.000E+00	40	32	no			
2	0.000E+00	-1.202E+02	0.000E+00	40	31	no			
1	0.000E+00	-5.870E+01	0.000E+00	39	31	yes			

Structural element data ...

Elem	ID	Nod1	Nod2	Prop	F-shear	F-axial	Mom-1	Mom-2
48	1	48	1	3	beam	8.100E+03	-2.764E+04	3.256E+03
47	1	47	48	3	beam	2.901E+03	-9.395E+04	4.826E+03
46	1	46	47	3	beam	2.527E+04	-3.998E+05	1.988E+04
45	1	45	46	3	beam	-1.021E+04	-5.963E+05	1.347E+04
44	1	44	45	3	beam	-4.449E+03	-5.213E+05	1.067E+04
43	1	43	44	3	beam	-1.692E+04	-2.766E+05	5.904E+02
42	1	42	43	3	beam	-7.777E+00	-3.478E+04	5.865E+02

41	1	41	42	3	beam	-1.458E+03	2.165E+04	7.710E-04	-5.860E+02
40	2	40	41	2	beam	-5.700E+02	5.361E+04	-2.291E+02	-3.635E-05
39	2	39	40	2	beam	1.387E+03	4.903E+04	3.556E+02	2.291E+02
38	2	38	39	2	beam	-2.292E+03	9.586E+04	-6.101E+02	-3.556E+02
37	2	37	38	2	beam	2.820E+03	1.013E+05	5.232E+02	6.102E+02
36	2	36	37	2	beam	-2.929E+03	1.580E+05	-6.544E+02	-5.231E+02
35	2	35	36	2	beam	8.277E+02	1.643E+05	-2.072E+02	6.543E+02
34	2	34	35	2	beam	-2.513E+02	1.906E+05	-3.570E+02	2.072E+02
33	2	33	34	2	beam	9.230E+01	2.188E+05	-2.989E+02	3.569E+02
32	2	32	33	2	beam	-3.434E+02	2.216E+05	-5.147E+02	2.988E+02
31	2	31	32	2	beam	7.353E+02	2.033E+05	-7.644E+01	5.147E+02
30	2	30	31	2	beam	-1.277E+03	1.658E+05	-7.661E+02	7.643E+01
29	2	29	30	2	beam	2.856E+03	1.692E+05	3.818E+02	7.661E+02
28	2	28	29	2	beam	-1.511E+03	1.193E+05	-2.254E+02	-3.818E+02
27	2	27	28	2	beam	7.603E+02	1.033E+05	9.480E+01	2.256E+02
26	2	26	27	2	beam	-1.102E+03	6.191E+04	-3.696E+02	-9.480E+01
25	2	25	26	2	beam	1.682E+03	6.779E+04	3.071E+02	3.691E+02
24	2	24	25	2	beam	-1.284E+02	2.115E+04	2.557E+02	-3.073E+02
23	2	23	24	2	beam	-1.004E+03	7.381E+03	-2.868E+02	-2.554E+02
22	2	22	23	2	beam	1.597E+03	-3.367E+04	6.648E+02	2.869E+02
21	2	21	22	2	beam	5.079E+02	-7.529E+04	9.842E+02	-6.650E+02
20	2	20	21	2	beam	-3.605E+02	-7.864E+04	7.576E+02	-9.842E+02
19	2	19	20	2	beam	-1.676E+03	-3.736E+04	-2.417E+02	-7.574E+02
18	2	18	19	2	beam	9.033E+02	2.939E+03	2.462E+02	2.417E+02
17	2	17	18	2	beam	3.743E+02	2.034E+04	3.968E+02	-2.464E+02
16	2	16	17	2	beam	-2.058E+03	7.131E+04	-4.299E+02	-3.972E+02
15	2	15	16	2	beam	1.970E+03	7.185E+04	4.001E+02	4.301E+02
14	2	14	15	2	beam	-4.496E+03	1.123E+05	-1.495E+03	-4.000E+02
13	2	13	14	2	beam	1.470E+04	1.160E+05	4.413E+03	1.495E+03
12	2	12	13	2	beam	2.096E+04	1.813E+05	3.754E+03	4.672E+03
11	2	11	12	2	beam	1.996E+04	1.709E+05	5.453E+03	5.331E+03
10	2	10	11	2	beam	6.930E+03	2.010E+05	4.982E+02	3.632E+03
9	2	9	10	2	beam	-1.688E+03	2.261E+05	-5.629E+02	-4.982E+02
8	2	8	9	2	beam	4.418E+02	2.240E+05	-2.852E+02	5.628E+02
7	2	7	8	2	beam	-6.844E+00	1.970E+05	-2.892E+02	2.851E+02
6	2	6	7	2	beam	-5.833E+02	1.696E+05	-6.045E+02	2.894E+02
5	2	5	6	2	beam	2.494E+03	1.649E+05	3.982E+02	6.045E+02
4	2	4	5	2	beam	-2.612E+03	1.123E+05	-6.513E+02	-3.985E+02
3	2	3	4	2	beam	2.694E+03	1.078E+05	4.841E+02	6.513E+02
2	2	2	3	2	beam	-1.984E+03	5.906E+04	-3.522E+02	-4.838E+02
1	2	1	2	2	beam	8.765E+02	5.838E+04	-4.022E-05	3.523E+02

Structural Properties ...

Prop Num.	Area	E	I	Dynamic Density	Plastic Moment
3	3.04800E-01	2.75800E+10	2.36000E-03	0.00000E+00	Not Set
2	3.78700E-03	1.64000E+11	1.72300E-05	0.00000E+00	Not Set
Prop. Num.	Cable Bond Stiffness	Cable Bond Strength	Yield Strength	Compressive Yield	Support Stiffness
3	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
2	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

Set log off

log-file recording stopped 11-Aug-95 14:24

Title: ESF Ground Support - Structural Steel Analysis

* FLAC log-file opened 11-Aug-95 14:24

From File : flac.ini

>res m53_k2.sav

following state has been restored:

date	time	step	grid	version
8-Aug-95	12:27	5210	70 X 70	3.22

Title:

>pr stru

Structural node data ...

Node	X	Y	X-disp	Y-disp	Ang-disp	Xfix	Yfix	Rfix
48	1.704E+00	-3.408E+00	1.438E-04	1.062E-03	-2.145E-04	no	no	no
47	1.205E+00	-3.614E+00	9.692E-05	1.155E-03	-1.794E-04	no	no	no
46	6.264E-01	-3.758E+00	4.759E-05	1.248E-03	-1.781E-04	no	no	no
45	0.000E+00	-3.810E+00	-1.428E-06	1.317E-03	-3.590E-06	no	no	no
44	-6.264E-01	-3.758E+00	-4.986E-05	1.249E-03	1.794E-04	no	no	no
43	-1.205E+00	-3.614E+00	-9.957E-05	1.153E-03	1.875E-04	no	no	no
42	-1.704E+00	-3.408E+00	-1.479E-04	1.058E-03	2.174E-04	no	no	no
41	-2.053E+00	-3.209E+00	-1.957E-04	9.785E-04	0.000E+00	no	no	no
40	-2.380E+00	-2.975E+00	-2.295E-04	8.741E-04	2.503E-04	no	no	no
39	-2.694E+00	-2.694E+00	-2.722E-04	7.758E-04	2.579E-04	no	no	no
38	-2.975E+00	-2.380E+00	-3.079E-04	6.525E-04	2.296E-04	no	no	no
37	-3.209E+00	-2.053E+00	-3.415E-04	5.516E-04	2.304E-04	no	no	no
36	-3.408E+00	-1.704E+00	-3.735E-04	4.089E-04	2.289E-04	no	no	no
35	-3.614E+00	-1.205E+00	-4.063E-04	2.401E-04	1.418E-04	no	no	no
34	-3.758E+00	-6.264E-01	-4.276E-04	4.756E-05	7.668E-05	no	no	no
33	-3.810E+00	0.000E+00	-4.312E-04	-1.696E-04	-2.761E-06	no	no	no
32	-3.758E+00	6.264E-01	-4.244E-04	-3.857E-04	-7.753E-05	no	no	no
31	-3.614E+00	1.205E+00	-4.057E-04	-5.749E-04	-1.320E-04	no	no	no
30	-3.408E+00	1.704E+00	-3.771E-04	-7.346E-04	-2.082E-04	no	no	no
29	-3.209E+00	2.053E+00	-3.468E-04	-8.693E-04	-2.305E-04	no	no	no
28	-2.975E+00	2.380E+00	-3.163E-04	-9.797E-04	-2.330E-04	no	no	no
27	-2.694E+00	2.694E+00	-2.843E-04	-1.100E-03	-2.420E-04	no	no	no
26	-2.380E+00	2.975E+00	-2.494E-04	-1.202E-03	-2.508E-04	no	no	no
25	-2.053E+00	3.209E+00	-2.212E-04	-1.312E-03	-2.670E-04	no	no	no
24	-1.704E+00	3.408E+00	-1.797E-04	-1.406E-03	-2.440E-04	no	no	no
23	-1.205E+00	3.614E+00	-1.365E-04	-1.525E-03	-2.159E-04	no	no	no
22	-6.264E-01	3.758E+00	-7.162E-05	-1.627E-03	-1.536E-04	no	no	no
21	0.000E+00	3.810E+00	4.960E-06	-1.662E-03	1.159E-05	no	no	no
20	6.264E-01	3.758E+00	7.839E-05	-1.614E-03	1.725E-04	no	no	no
19	1.205E+00	3.614E+00	1.344E-04	-1.505E-03	1.924E-04	no	no	no
18	1.704E+00	3.408E+00	1.734E-04	-1.408E-03	2.102E-04	no	no	no
17	2.053E+00	3.209E+00	2.148E-04	-1.323E-03	2.586E-04	no	no	no
16	2.380E+00	2.975E+00	2.428E-04	-1.216E-03	2.387E-04	no	no	no
15	2.694E+00	2.694E+00	2.788E-04	-1.121E-03	2.435E-04	no	no	no
14	2.975E+00	2.380E+00	3.112E-04	-1.006E-03	1.859E-04	no	no	no
13	3.209E+00	2.053E+00	3.430E-04	-8.999E-04	3.888E-04	no	no	no
12	3.408E+00	1.704E+00	3.774E-04	-7.562E-04	3.217E-04	no	no	no
11	3.614E+00	1.205E+00	4.080E-04	-5.928E-04	3.521E-04	no	no	no
10	3.758E+00	6.264E-01	4.282E-04	-3.959E-04	1.997E-05	no	no	no
9	3.810E+00	0.000E+00	4.323E-04	-1.759E-04	1.473E-05	no	no	no
8	3.758E+00	-6.264E-01	4.279E-04	4.273E-05	-8.171E-05	no	no	no
7	3.614E+00	-1.205E+00	4.073E-04	2.405E-04	-1.425E-04	no	no	no
6	3.408E+00	-1.704E+00	3.748E-04	4.123E-04	-2.302E-04	no	no	no
5	3.209E+00	-2.053E+00	3.420E-04	5.559E-04	-2.359E-04	no	no	no
4	2.975E+00	-2.380E+00	3.062E-04	6.585E-04	-2.384E-04	no	no	no
3	2.694E+00	-2.694E+00	2.691E-04	7.832E-04	-2.534E-04	no	no	no
2	2.380E+00	-2.975E+00	2.275E-04	8.779E-04	-2.464E-04	no	no	no

Node	2.053E+00	-3.209E+00	1.922E-04	9.834E-04	0.000E+00	no	no	no
	X-load	Y-load	Moment	i j Pin	Sh. force	Angle	Bond	
48	0.000E+00	0.000E+00	0.000E+00	39 30 no				
47	0.000E+00	0.000E+00	0.000E+00	38 30 no				
46	0.000E+00	0.000E+00	0.000E+00	37 30 no				
45	0.000E+00	0.000E+00	0.000E+00	36 30 no				
44	0.000E+00	0.000E+00	0.000E+00	35 30 no				
43	0.000E+00	0.000E+00	0.000E+00	34 30 no				
42	0.000E+00	0.000E+00	0.000E+00	33 30 no				
41	0.000E+00	-5.870E+01	0.000E+00	33 31 yes				
40	0.000E+00	-1.321E+03	0.000E+00	32 31 no				
39	0.000E+00	-2.925E+03	0.000E+00	32 32 no				
38	0.000E+00	-2.922E+03	0.000E+00	31 32 no				
37	0.000E+00	-1.174E+02	0.000E+00	31 33 no				
36	0.000E+00	-1.375E+02	0.000E+00	30 33 no				
35	0.000E+00	-1.659E+02	0.000E+00	30 34 no				
34	0.000E+00	-1.788E+02	0.000E+00	30 35 no				
33	0.000E+00	-1.835E+02	0.000E+00	30 36 no				
32	0.000E+00	-1.788E+02	0.000E+00	30 37 no				
31	0.000E+00	-1.659E+02	0.000E+00	30 38 no				
30	0.000E+00	-1.375E+02	0.000E+00	30 39 no				
29	0.000E+00	-1.174E+02	0.000E+00	31 39 no				
28	0.000E+00	-1.202E+02	0.000E+00	31 40 no				
27	0.000E+00	-1.230E+02	0.000E+00	32 40 no				
26	0.000E+00	-1.202E+02	0.000E+00	32 41 no				
25	0.000E+00	-5.366E+03	0.000E+00	33 41 no				
24	0.000E+00	-1.375E+02	0.000E+00	33 42 no				
23	0.000E+00	-1.659E+02	0.000E+00	34 42 no				
22	0.000E+00	-1.788E+02	0.000E+00	35 42 no				
21	0.000E+00	-1.041E+04	0.000E+00	36 42 no				
20	0.000E+00	-1.788E+02	0.000E+00	37 42 no				
19	0.000E+00	-1.659E+02	0.000E+00	38 42 no				
18	0.000E+00	-1.375E+02	0.000E+00	39 42 no				
17	0.000E+00	-5.366E+03	0.000E+00	39 41 no				
16	0.000E+00	-1.202E+02	0.000E+00	40 41 no				
15	0.000E+00	-1.230E+02	0.000E+00	40 40 no				
14	0.000E+00	-1.202E+02	0.000E+00	41 40 no				
13	0.000E+00	-1.511E+04	9.085E+03	41 39 no				
12	0.000E+00	-1.513E+04	9.085E+03	42 39 no				
11	0.000E+00	-1.516E+04	9.085E+03	42 38 no				
10	0.000E+00	-1.788E+02	0.000E+00	42 37 no				
9	0.000E+00	-1.835E+02	0.000E+00	42 36 no				
8	0.000E+00	-1.788E+02	0.000E+00	42 35 no				
7	0.000E+00	-1.659E+02	0.000E+00	42 34 no				
6	0.000E+00	-1.375E+02	0.000E+00	42 33 no				
5	0.000E+00	-1.174E+02	0.000E+00	41 33 no				
4	0.000E+00	-1.202E+02	0.000E+00	41 32 no				
3	0.000E+00	-1.230E+02	0.000E+00	40 32 no				
2	0.000E+00	-1.202E+02	0.000E+00	40 31 no				
1	0.000E+00	-5.870E+01	0.000E+00	39 31 yes				

Structural element data ...

Elem	ID	Nod1	Nod2	Prop		F-shear	F-axial	Mom-1	Mom-2
48	1	48	1	3	beam	2.058E+04	-2.727E+04	8.271E+03	-9.727E-04
47	1	47	48	3	beam	-1.499E+04	-1.365E+05	1.723E+02	-8.271E+03
46	1	46	47	3	beam	-7.394E+01	-3.360E+05	1.271E+02	-1.711E+02
45	1	45	46	3	beam	5.710E+04	-5.907E+05	3.601E+04	-1.274E+02
44	1	44	45	3	beam	-5.430E+04	-5.918E+05	1.884E+03	-3.601E+04
43	1	43	44	3	beam	-3.358E+03	-3.295E+05	-1.156E+02	-1.886E+03
42	1	42	43	3	beam	1.376E+04	-1.333E+05	7.317E+03	1.129E+02

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41	1	41	42	3	beam	-1.820E+04	-1.464E+04	-5.853E-04	-7.317E+03
40	2	40	41	2	beam	-4.445E+02	5.212E+04	-1.786E+02	-3.660E-05
39	2	39	40	2	beam	1.091E+03	5.117E+04	2.812E+02	1.787E+02
38	2	38	39	2	beam	-2.235E+03	9.969E+04	-6.605E+02	-2.812E+02
37	2	37	38	2	beam	3.314E+03	9.885E+04	6.717E+02	6.603E+02
36	2	36	37	2	beam	-3.398E+03	1.671E+05	-6.938E+02	-6.718E+02
35	2	35	36	2	beam	8.822E+02	1.656E+05	-2.172E+02	6.938E+02
34	2	34	35	2	beam	-3.065E+02	1.909E+05	-4.000E+02	2.173E+02
33	2	33	34	2	beam	1.363E+02	2.143E+05	-3.143E+02	4.000E+02
32	2	32	33	2	beam	-6.954E+01	2.128E+05	-3.580E+02	3.143E+02
31	2	31	32	2	beam	3.341E+02	1.884E+05	-1.589E+02	3.580E+02
30	2	30	31	2	beam	-8.863E+02	1.579E+05	-6.376E+02	1.589E+02
29	2	29	30	2	beam	2.392E+03	1.559E+05	3.239E+02	6.377E+02
28	2	28	29	2	beam	-1.700E+03	1.141E+05	-3.594E+02	-3.241E+02
27	2	27	28	2	beam	1.420E+03	9.885E+04	2.388E+02	3.594E+02
26	2	26	27	2	beam	-1.412E+03	6.172E+04	-3.562E+02	-2.387E+02
25	2	25	26	2	beam	1.203E+03	6.485E+04	1.276E+02	3.559E+02
24	2	24	25	2	beam	1.680E+02	1.744E+04	1.951E+02	-1.276E+02
23	2	23	24	2	beam	-1.768E+02	5.300E+03	9.929E+01	-1.948E+02
22	2	22	23	2	beam	6.576E+02	-3.989E+04	4.914E+02	-9.946E+01
21	2	21	22	2	beam	7.998E+02	-7.235E+04	9.941E+02	-4.914E+02
20	2	20	21	2	beam	-8.607E+02	-6.711E+04	4.530E+02	-9.940E+02
19	2	19	20	2	beam	-1.204E+03	-3.067E+04	-2.647E+02	-4.531E+02
18	2	18	19	2	beam	1.325E+03	-2.179E+02	4.511E+02	2.644E+02
17	2	17	18	2	beam	-5.508E+02	1.195E+04	2.297E+02	-4.511E+02
16	2	16	17	2	beam	-1.835E+03	6.147E+04	-5.089E+02	-2.287E+02
15	2	15	16	2	beam	2.566E+03	5.255E+04	5.725E+02	5.089E+02
14	2	14	15	2	beam	-4.552E+03	9.505E+04	-1.345E+03	-5.734E+02
13	2	13	14	2	beam	1.379E+04	1.088E+05	4.197E+03	1.345E+03
12	2	12	13	2	beam	2.198E+04	1.633E+05	3.945E+03	4.888E+03
11	2	11	12	2	beam	1.962E+04	1.608E+05	5.458E+03	5.140E+03
10	2	10	11	2	beam	6.887E+03	1.965E+05	4.777E+02	3.627E+03
9	2	9	10	2	beam	-1.595E+03	2.166E+05	-5.247E+02	-4.776E+02
8	2	8	9	2	beam	2.900E+02	2.152E+05	-3.425E+02	5.247E+02
7	2	7	8	2	beam	1.814E+02	1.963E+05	-2.343E+02	3.424E+02
6	2	6	7	2	beam	-8.307E+02	1.690E+05	-6.830E+02	2.342E+02
5	2	5	6	2	beam	3.200E+03	1.672E+05	6.034E+02	6.830E+02
4	2	4	5	2	beam	-3.090E+03	1.003E+05	-6.388E+02	-6.032E+02
3	2	3	4	2	beam	2.554E+03	9.902E+04	4.372E+02	6.389E+02
2	2	2	3	2	beam	-1.851E+03	4.919E+04	-3.426E+02	-4.373E+02
1	2	1	2	2	beam	8.523E+02	5.076E+04	-2.051E-05	3.426E+02

Structural Properties ...

Prop Num.	Area	E	I	Dynamic Density	Plastic Moment
3	3.04800E-01	2.75800E+10	2.36000E-03	0.00000E+00	Not Set
2	3.78700E-03	1.64000E+11	1.72300E-05	0.00000E+00	Not Set
Prop. Num.	Cable Bond Stiffness	Cable Bond Strength	Yield Strength	Compressive Yield	Support Stiffness
3	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
2	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

set log off

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ATTACHMENT III STEEL SET MEMBER AND COMPONENT DESIGN

PURPOSE:	TITLE:	PAGE:
III.A	STEEL SET CALCULATION <ul style="list-style-type: none"> • W8x31; With & Without Seismic • W6x20; With & Without Seismic • W8x31; With 27 Ton Jacking Load • W6x20 at 6 Ft Spacing 	III- 2
III.B	STEEL SET LAGGING CALCULATION	III- 30
III.C	JACKING BRACKET ASSEMBLY CALCULATION <ul style="list-style-type: none"> • 27 Ton Jacking Force @ W8x31 • 17 Ton Jacking Force @ W6x20 	III- 46
III.D	TIE ROD AND PIPE SPACER CALCULATION	III- 60
III.E	STEEL SET FOOT PLATE CALCULATION <ul style="list-style-type: none"> • Alternate I Foot Plate • Alternate III Foot Plate • Maximum Steel Set Foot Plate Offset 	III- 65
III.F	STEEL SET FOOT SEGMENT CALCULATION <ul style="list-style-type: none"> • W8x31 Foot Segment • W6x20 Foot Segment 	III- 85
III.G	CONNECTION BETWEEN STEEL SET SEGMENTS CALC. <ul style="list-style-type: none"> • W8x31 Connection • W6x20 connection • Skewed Bolt 	III- 95
III.H	STABILITY OF STEEL SET FOOT SEGMENT <ul style="list-style-type: none"> • W8x31 Stability • W6x20 Stability 	III-104
III.I	NOT USED	III-116
III.J	NOT USED	III-116
III.K	SHIM PLATE CALCULATION <ul style="list-style-type: none"> • W8x31 Shim Plates • W6x20 shim Plates 	III-117
III.L	STEEL WEDGES	III-122

PURPOSE III. A STEEL SET CALCULATION

NOTE: REFER TO ATTACHMENT IX, PAGE IX-3 & IX-5 FOR STEEL SET SKETCHES.

CRITICAL STRESS COMBINATIONS

{ LOOK @ WORST COMBINATIONS OF HIGH AXIAL COMPRESSION & HIGH MOMENTS. NOTE: AXIAL COMPRESSION GIVES GREATEST CONTRIBUTION TO INTERACTION EQUATIONS OF AISC CHAPTER H }

FILE: P10K 2 dy - WITH SEISMIC LOAD STEEL SET @ 2'0

F-axial N	MOMENT N-M	ELEM. NO.
1,324,000	15,050	36
1,282,000	16,320	29
1,349,000	12,430	12
KIPS ($\times 2.2481 \times 10^{-4}$)	FT-K (0.73752×10^{-3})	
297.65	11.10	
288.21	12.04	
303.27	9.17	

WRX31

a) MULTIPLY
FORCE IN (N)
by 2.2481×10^{-4}
TO OBTAIN FORCE
IN KIPS.

b) MULTIPLY
MOMENTS IN
(N-M) by
 0.73752×10^{-3}
TO OBTAIN
MOMENTS IN
FT-K.

THE STEEL SETS IN THIS RUN ARE
AT 2'0 C/C * $.3048^{\text{m/ft}} = .61 \text{ M.}$

MULTIPLY STRESSES IN PREVIOUS
TABLES - given for ONE METER!

by .61 TO OBTAIN STRESSES
PER ONE STEEL SET

F-axial	MOMENT	CASE
K / STEEL SET	FT-K / STEEL SET	
181.57	6.77	1
175.81	7.34	2
185.00	5.60	3

CHECK INTERACTION COEFFICIENT FOR
EACH OF THE ABOVE.

UNBRACED LENGTH - ALLOWABLE STRESS

$L_x = \text{DISTANCE BETW BLOCKING (SUPPORT)} = 4 \text{ ELEMENTS} \approx 75' < L_y$ NOT GOVERN.

$L_y = \pi (12.42' - \frac{45'}{12}) (\frac{35'}{12}) (1) = 7.36' = 88.29"$ --- TIE ROD SPACING
 Length used is a conservative assurance against buckl- (BABEE0000-01717-2100-4110, A
 ing. W-shape used when fully loaded is braced by contact with the tunnel wall.

$$F_a = 18.89 \text{ KSI} \quad \text{--- (AISC 3-16, TABLE C-36)}$$

$$\frac{KL_y}{r_y} = \frac{1.0 \times 88.29}{2.02} = 43.71$$

$L_c = 8.4'$ --- AISC PAGE 2-12, $L_y = 7.36' < L_c \Rightarrow F_{bx} = 0.66 F_y = 24 \text{ KSI}$

$$F_b = 24.0 \text{ KSI}$$

@ ELEM. 36 & 29, $\frac{KL_b}{r_b} = \frac{(1.0)(18.66)(12)}{3.47} = 64.5 \Rightarrow F'_c = 35.9$

@ ELEM 12, $\frac{KL_b}{r_b} = \frac{(1.0)(17.54)(12)}{3.47} = 60.7 \Rightarrow F'_c = 40.54$

$F'_c = 35.9$ --- AISC PAGE 5-122, TABLE 8

Case 3 AISC 5-54 H1-L

$$f_a = \frac{185}{9.13} = 20.26 \text{ KSI}$$

$$R_b = \frac{5.60 \times 12}{27.5} = 2.44$$

$$\frac{20.26}{18.89} + \frac{2.44}{\left(1 - \frac{20.26}{40.54}\right) \times 24} =$$

$$1.073 + .203 = 1.276 < 1.33 \text{ OK}$$

CASE 2

$$f_a = \frac{175.81}{9.13} = 19.26 \text{ ksi}$$

$$f_b = \frac{7.34 \times 12}{27.5} = 3.2 \text{ ksi}$$

$$\frac{19.26}{18.89} + \frac{3.2}{\left(1 - \frac{19.26}{35.9}\right) \times 24.0}$$

$$1.02 + .288 = 1.31 < 1.33 \quad \text{OK}$$

CASE 1

$$f_a = \frac{181.57}{9.13} = 19.89 \text{ ksi}$$

$$f_b = \frac{6.77 \times 12}{27.5} = 2.95 \text{ ksi}$$

$$\frac{19.89}{18.89} + \frac{2.95}{\left[1 - \left(\frac{19.89}{35.9}\right)\right] \times 24.0} = 1.053 + 0.276 = 1.328$$

$$\leq 1.33$$

FILE: P34 K2dy. W8x31 @ 4'-0"
W/SE=MC.

CASE	axial (N)	M (N-M)	ELEM. NO
1	603,100	10,110	11
2	869,000	1,849	33

axial (K) M (Ft-K)

1	135,58 * 1.22 = 165.41	7.46 * 1.22 = 9.10
2	195.36 * 1.22 = 238.34	1.36 * 1.22 = 1.66

$$C = \frac{P_a}{F_a} + \frac{P_b}{(1 - \frac{P_a}{F_a}) F_b}$$

L*

1	18.117	3.971	.96 + .242 = 1.202
2	26.11	.724	1.382 + .053 = 1.433

1.4 > 1.33 W8x31 NOT GOOD

@ 4'-0" IN THIS AREA

RERUN FOR 2'-0" c/c.

* @ ELEM. 11: $\frac{K L_b}{r_b} = \frac{(1.0)(12.91)(12)}{3.47} = 44.6$, $F_c' = 75.09$

@ ELEM. 33: $\frac{K L_b}{r_b} = \frac{(1.0)(13.23)(12)}{3.47} = 45.8$, $F_c' = 71.20$

NEW FILE: p 34 k 2 d y x

W 8 x 31 @ 2'-0"
W/SE/ENIC.

CASE	Farial (N)	M (N-M)	ELEM. NO.
1	1,446,000	4,630	32
2	1,125,000	7,202	30
3	1,137,000	12,270	11
	Farial (K)	M (F _A - K)	

$$1 \quad 325.08 * .61 = \underline{198.30} \quad 3.415 * .61 = 2.083$$

$$2 \quad 252.91 * .61 = \underline{154.28} \quad 5.312 * .61 = 3.24$$

$$3 \quad 255.61 * .61 = \underline{155.92} \quad 9.050 * .61 = 5.52$$

$$C = \frac{f_a}{F_a} + \frac{f_b}{\left(1 - \frac{f_a}{F_e}\right) F_b}$$

$$1 \quad 21.72 \quad 0.909 \quad 1.150 + .06 = 1.210 < 1.33$$

$$2 \quad 16.90 \quad 1.414 \quad 0.89 + .086 = .980 < 1.33$$

$$3 \quad 17.08 \quad 2.409 \quad 0.904 + 0.144 = 1.048 < 1.33$$

W 8 x 31 - OK FOR 2'-0" c/c

$$* \text{ELEM } 32 \text{ \& } 30 \quad \frac{K L_y}{r_y} = 45.8, F_e = 71.2$$

$$\text{ELEM } 11 \quad F_e = 75.1$$

FILE : P 07 k 2 dy .

W8x31 @ 4'-0
W/SEISMIC .

F axial (N)

M (N-M) , ELEM. NO.

	F axial (N)	M (N-M)	ELEM. NO.
1	341,600	1,277	33
2	344,900	949	9
3	280,000	1,669	6
4	282,500	6,124	11

F axial (K)

M (F-K)

	F axial (K)	M (F-K)
1	$76.80 \times 1.22 = 93.70$	$.942 \times 1.22 = 1.15$
2	$77.54 \times 1.22 = 94.60$	$.700 \times 1.22 = .854$
3	$62.95 \times 1.22 = 76.80$	$1.231 \times 1.22 = 1.50$
4	$63.51 \times 1.22 = 77.48$	$4.517 \times 1.22 = 5.51$

f_a f_b C

	f_a	f_b	C
1	10.26	0.50	$.543 + .028 = .571$
2	10.36	0.37	$.548 + .018 = .566$
3	8.41	0.65	$.445 + .032 = .477$
4	8.49	2.40	$.449 + 0.122 = 0.571$

all < 1.33

$$F_e' : @ \text{ELEM } 33 \quad K L_b / r_b = \frac{13.30 \times 12}{3.47} = 46.0, \quad F_e' = 70.6$$

$$@ \text{ELEM } 6, 9, \& 11 \quad K L_b / r_b = \frac{8.96 \times 12}{3.47} = 30.3, \quad F_e' = 162.8$$

FILE: P 18K2dy - SEISMIC W8x31
@ 41-0

CASE	Faxial (N)	M (N-M)	ELEM. NR
1	557,700	3,650	36
2	776,100	2,113	33
3	587,500	9,528	11
4	706,000	3,308	10

@ ELEM. 36 & 33 : $\frac{KL_b/r_b}{3.47} = \frac{(1.0)(10.12)(12)}{3.47} = 35.0$, $F_e' = 121.9$

ELEM 11 & 10 : $\frac{KL_b/r_b}{3.47} = \frac{(1.0)(6.07)(12)}{3.47} = 21.0$, $F_e' = 338.6$

Faxial (K) M (Ft-K)

1	$125.38 \times 1.22 = 152.96$	$2.69 \times 1.22 = 3.28$
2	$174.48 \times " = 212.86$	$1.56 \times " = 1.90$
3	$132.08 \times " = 161.14$	$7.03 \times " = 8.58$
4	$158.72 \times " = 193.64$	$2.44 \times " = 2.98$

CASE 2 $f_a = \frac{212.86}{9.13} = 23.31$; $f_b = \frac{1.9 \times 12}{27.5} = .83$

$$\frac{23.31}{18.89} + \frac{.83}{\left(1 - \frac{23.31}{121.9}\right) 21.6} = 1.23 + .048$$

$$= 1.278 < 1.33$$

CASE 3 $f_a = \frac{161.13}{9.13} = 17.65$; $f_b = \frac{8.53 \times 12}{27.5} = 3.74$

$$\frac{17.65}{18.89} + \frac{3.74}{\left(1 - \frac{17.65}{338.6}\right) 21.6} = .934 + .183$$

$$= 1.117 < 1.33$$

OTHER CASES ARE LESS CRITICAL
BY INSPECTION -

FILE m 34 k 250 x.

W 8 x 31 c 2' - 0"
NO SEISMIC.

CASE	Faxial (N)	M (N-M)	ELEM. NO
1	1,163,000	3,805	32

2	897,800	10,770	11
---	---------	--------	----

3	1,048,000	6,292	10
---	-----------	-------	----

	Faxial (K)	M (Ft-K)
--	------------	----------

1	$261.45 * .61 = 159.48$	$2.81 * .61 = 1.72$
---	-------------------------	---------------------

2	$201.83 * .61 = 123.12$	$7.94 * .61 = 4.84$
---	-------------------------	---------------------

3	$235.60 * .61 = 143.7$	$4.64 * .61 = 2.83$
---	------------------------	---------------------

F_e' : @ ELEM 32, $L = 13.27$ $K L / r_b = 45.9$, $F_e' = 70.9$

@ ELEM 10, 11 $L = 9.86$ $K L / r_b = 34.1$, $F_e' = 128.5$

	f_a	f_b	C
--	-------	-------	---

1	17.47	.75	$.925 + .046 = .971 < 1$
---	-------	-----	--------------------------

3	13.49	2.11	$.714 + .109 = .823 < 1$
---	-------	------	--------------------------

4	15.74	1.235	$.833 + .065 = .898 < 1$
---	-------	-------	--------------------------

OK

FILE M10 K 250 W.

WB x 31 @ 2'-0"
NO SEISMIC

CASE	axial (N)	M (N-M)	ELEM NO
1	922,000	12,840	29
2	868,100	18,060	11

axial (K) M (Ft-K)

1	$207.27 * .61 = 126.43$	$9.47 * .61 = 5.78$
2	$195.16 * .61 = 119.05$	$13.32 * .61 = 8.13$

fa fb C

1	13.85	2.52	$0.733 + 0.176 = .909$
2	13.04	3.55	$0.690 + 0.221 = .911$

all < 1.00 OK.

$$F_e' : \text{ @ ELEM 29 } , K L_b / r_b = \frac{(1.0)(17.48)(12)}{3.47} = 60.4 , F_e' = 40.94$$

$$\text{ @ ELEM 11 } , K L_b / r_b = \frac{(1.0)(15.70)(12)}{3.47} = 54.3 , F_e' = 50.66$$

FILE: MM 18 K 250 W 8 X 31 4'0" c/c NO SEISMIC

CASE	F axial (N)	M (N-M)	ELEM NO
1	522,500	3,371	10
2	416,600	8,389	11
3	583,300	1,492	8

CASE	F (K)	M (Ft-K)
------	-------	----------

1 $117.46 * 1.22 = 143.3$ $2.49 * 1.22 = 3.04$

2 $93.66 * 1.22 = 114.3$ $6.19 * 1.22 = 7.55$

3 $131.13 * 1.22 = 160.0$ $1.10 * 1.22 = 1.34$

CASE $f_a = \frac{F}{A}$ $f_b = \frac{M}{S}$ $C = \frac{f_a}{F_c} + \frac{f_b}{\left(1 - \frac{f_a}{F_c}\right) F_b}$

$K L / r = \frac{8.74 * 12}{3.47} = 30.2$, $F_c = 163.8$

1 15.696 1.33 $.831 + .068 = .899$

2 12.515 3.29 $.662 + .165 = .827$

3 17.525 $.59$ $.928 + .031 = .959$

< 1.01

FILE M07K250W W8x31 @ 4'-0"

NO SEISMIC

axial (N) M (N-M) ELEM. NO

1	212,500	720	33
2	163,800	5,419	11
3	196,500	3,808	10

axial (K) M (F_T-K)

1	$47.77 \times 1.22 = 58.28$	$.53 \times 1.22 = .65$
2	$36.82 \times 1.22 = 44.92$	$4.00 \times 1.22 = 4.88$
3	$44.18 \times 1.22 = 53.90$	$2.81 \times 1.22 = 3.43$

f_a f_b C

1	6.38	.28	$.338 + .014 = .352$
2	4.92	2.13	$.260 + .100 = .360$
3	5.90	1.50	$.312 + .071 = .383$

F'_e : @ ELEM 33, $\frac{KL}{r} = \frac{13.37(12)}{3.47} = 46.3$, $F'_e = 69.7$, ALL < 1.0

@ ELEM 10 & 11, $\frac{KL}{r} = \frac{6.62(12)}{3.47} = 21.6$, $F'_e = 320.6$

FILE M18-K2 dy W6x20 @ 4'-0"
w/SEISMIC

CASE	axial (N)	M (N-M)	ELEM. NO.
1	170,500	4,049	12
2	153,400	5,926	11
3	271,500	724	9

axial (K) M (F_T-K)

1	$38.33 \times 1.22 = 46.76$	$2.99 \times 1.22 = 3.65$
2	$34.49 \times 1.22 = 42.08$	$4.37 \times 1.22 = 5.33$
3	$61.04 \times 1.22 = 74.47$	$.534 \times 1.22 = .652$

W6x20 $A = 5.87 \text{ in}^2$ $S = 13.4 \text{ in}^3$ $\frac{K L_y}{r_y} = \frac{88.29}{1.46} = 58.9$

$F_a = 17.54$, $\frac{K L_b}{r_b} = \frac{7.54 \times 12}{2.66} = 34.0$, $F_e = 129.18$ $L_c = 6.4'$

f_a

f_b

C

1	7.96	3.27	$.454 + .161 = .615$
2	7.17	4.77	$.409 + .234 = .643$
3	12.69	.584	$.723 + .044 = .767$
ALL < 1.33 OK			

FILE : M 07- K₂ dy W6x20 @ 4-0
W/SEISMIC

CASE	axial (N)	M (N-M)	ELEM NO
1	121,300	197	33
2	95,300	5,490	11
3	118,900	427	8

axial (K) M (K-M)

1	$27.27 \times 1.22 = 33.27$	$1.15 \times 1.22 = 1.83$
2	$21.42 \times 1.22 = 26.13$	$4.05 \times 1.22 = 4.94$
3	$26.73 \times 1.22 = 32.61$	$1.32 \times 1.22 = 1.39$

f_a f_b C

1	5.67	1.64	$.323 + .009 = .332$
2	4.45	4.42	$.254 + .212 = .466$
3	5.56	1.35	$.1317 + .017 = .134$

ALL < 1.0 --- O.K.

$$F_e: @ \text{ELEM 33 } K L / r_b = \frac{12.68(12)}{2.66} = 57.2, F_e = 45.6$$

$$@ \text{ELEM 11 } K L / r_b = \frac{7.36(12)}{2.66} = 33.2, F_e = 135.5$$

$$@ \text{ELEM 8 } K L / r_b = \frac{7.33 \times 12}{2.66} = 33.0, F_e = 137.13$$

FILE M27- k2 dy

W6x20 @ 4'-0

W/ SEI = 211C.

Case	axial (N)	M (N-M)	ELEM. NO
------	-----------	---------	----------

1	202,400	888	35
---	---------	-----	----

2	270,500	456	33
---	---------	-----	----

3	268,100	613	8
---	---------	-----	---

axial (K)

M (Ft-K)

1	$45.50 * 1.22 = 55.51$	$.655 * 1.22 = .80$
---	------------------------	---------------------

2	$60.81 * 1.22 = 74.19$	$.336 * 1.22 = .41$
---	------------------------	---------------------

3	$60.27 * 1.22 = 73.53$	$.452 * 1.22 = .55$
---	------------------------	---------------------

 f_a f_b

C

1	9.46	.716	$.539 + .043 = .582$
---	------	------	----------------------

2	12.64	.367	$.721 + .021 = .745$
---	-------	------	----------------------

3	12.53	.493	$.714 + .025 = .739$
---	-------	------	----------------------

ALL < 1.33 --- O.K.

 $F_e' : @ \text{ELEM } 33 \text{ \& } 35, \quad K L_b / r_b = \frac{13.07 * (12)}{2.66} = 59.0, \quad F_e' = 42.9$
 $@ \text{ELEM } 8, \quad K L_b / r_b = \frac{7.61 * 12}{2.66} = 34.3, \quad F_e' = 127.0$

FILE M 34-C2K2 d. W6x20 @ 4'-0"
WITH SEISMIC.

CASE FAXIAL (N) M (N-M) ELEM.

1 303,000 2,308 36

2 388,900 782 33

3 320,800 3228 12

FAXIAL (K) M (F_E - K)

1 $68.12 \times 1.22 = 83.11$ $1.70 \times 1.22 = 2.074$

2 $87.43 \times 1.22 = 106.66$ $0.58 \times 1.22 = 0.708$

3 $72.3 \times 1.22 = 88.20$ $2.38 \times 1.22 = 2.904$

f_a f_b C

1 14.16 1.86 $0.807 + 0.128 = 0.94$

2 18.17 0.63 $1.036 + 0.051 = 1.087$

3 15.00 2.60 $0.855 + 0.123 = 0.978$

ALL ARE < 1.33 ∴ OK

From page III-17 (SIMILAR)

@ Nodes 33 & 36: $F_c' = 42.9$ e $l_x = 13.1'$

@ Node 12: $F_c' = 127.0$ e $l_x = 7.54'$

FILE: M53_K2.dwg

W6 x 20 @ 4'-0"
W/ SEISMIC

CASE	axial (N)	M (N-M)	ELEM. NO
1	202,400	5,463	11
2	245,200	3,614	10
3	271,200	552	9

	axial (K)	M (Ft-K)
1	$45.50 \times 1.22 = 55.51$	$4.03 \times 1.22 = 4.92$
2	$55.12 \times 1.22 = 67.25$	$2.67 \times 1.22 = 3.26$
3	$60.97 \times 1.22 = 74.38$	$1.407 \times 1.22 = 1.497$

	f_a	f_b	C
1	9.46	4.41	$0.593 + 0.217 = 0.756$
2	11.46	2.92	$0.653 + 0.146 = 0.800$
3	12.67	1.445	$0.722 + 0.022 = 0.744$

ALL < 1.33 --- O.K.

$$F_c: @ \text{ELEM. 9, 10, \& 11. } \frac{K L_b}{r_b} = \frac{6.89(12)}{2.66} = 31.1, F_c = 154.4$$

FILE M 18-K2.

W6x20 p 410

NO SEISMIC

Faxial (N)

M (N-M) ELEM. NO

1 153,500

3,602 10

2 198,800

782 9

Faxial (K)

M (F_t-K)

1 34.51 * 1.22 = 42.10

2.66 * 1.22 = 3.25

2 44.69 * 1.22 = 54.52

.58 * 1.22 = .71

 f_a f_b

C

1 7.17

2.91

.409 + .143 = .552

2 9.29

.64

.530 + .032 = .562

ALL < 1.0 --- O.K.

$$F_e' : \frac{K L_b}{r_x} = \frac{(7.52)(12)}{2.66} = 34, F_e' = 129.2$$

FILE m07_K2.

W6x20 @ 4'-0"

NO SEISMIC

CASE	axial (N)	M (N-M)	ELEM. NO
1	49,250	5,390	12
2	63,010	3,575	10
3	67,980	783	9

axial (K)M (Ft-K)

1	$11.07 * 1.22 = 13.51$	$3.98 * 1.22 = 4.86$
2	$14.17 * 1.22 = 17.29$	$2.64 * 1.22 = 3.22$
3	$15.28 * 1.22 = 18.64$	$1.578 * 1.22 = 1.905$

f_ef_bC

1	2.30	4.35	$.131 + .205 = .336$
2	2.95	2.88	$.168 + .136 = .304$
3	3.18	.63	$.181 + .030 = .211$

$$F_e' : k \cdot l_b / r_b = \frac{7.5 \times 12}{2.66} = 34, F_e' = 129.2$$

ALL < 1.0 --- O.K.

FILE M27-K2

W6x20 @ 4'-0"

No SEISMIC

CASE	axial (N)	M (N-M)	ELEM NO
------	-----------	---------	---------

1	215,000	404	33
---	---------	-----	----

2	159,300	4,962	12
---	---------	-------	----

3	158,200	5,396	11
---	---------	-------	----

4	188,100	3,688	10
---	---------	-------	----

axial (K)

M (K-M)

1	$48.33 \times 1.22 = 58.96$	$0.30 \times 1.22 = 0.366$
---	-----------------------------	----------------------------

2	$35.81 \times 1.22 = 43.69$	$3.66 \times 1.22 = 4.46$
---	-----------------------------	---------------------------

3	$35.56 \times 1.22 = 43.38$	$3.98 \times 1.22 = 4.86$
---	-----------------------------	---------------------------

4	$42.29 \times 1.22 = 51.59$	$2.72 \times 1.22 = 3.32$
---	-----------------------------	---------------------------

 F_c : @ ELEM 33, $K_{cb}/r_b = 13.20 \times 12 / 2.66 = 60$, $F_c = 41.5$

 @ ELEM 10, 12, $K_{cb}/r_b = 32$, $F_c = 145.8$

	F_a	F_b	C
1	10.04	32.3	$1.572 + .020 = 1.592 < 1.0$

2	7.44	3.99	$1.424 + .195 = 1.619 < 1$
---	------	------	----------------------------

3	7.39	4.35	$1.421 + .212 = 1.633 < 1$
---	------	------	----------------------------

4	8.79	2.97	$1.501 + .146 = 1.647 < 1.0$
---	------	------	------------------------------

FILE MM 34 - K2.

W6x20 @ 4'-0"
- NO SEISMIC.

CASE	axial (N)	M (N-M)	ELEM. No
1	181,300	4,672	12
2	170,900	5,453	11
3	201,000	3,632	10
4	226,100	533	9

axial (K) M (Ft-K)

1	$40.76 * 1.22 = 49.74$	$3.45 * 1.22 = 4.21$
2	$39.42 * 1.22 = 46.87$	$4.02 * 1.22 = 4.90$
3	$45.19 * 1.22 = 55.13$	$2.68 * 1.22 = 3.27$
4	$50.83 * 1.22 = 62.01$	$4.15 * 1.22 = 0.506$

$$F_e: \frac{KLb}{r_b} = 32, F_e = 145.8$$

	f_a	f_b	C
1	8.47	3.77	$.483 + .185 = .668 < 1$
2	7.98	4.39	$.455 + .215 = .670 < 1$
3	9.39	2.93	$.535 + .145 = .68 < 1$
4	10.56	1.453	$.602 + .023 = .625 < 1$

(OK)

FILE MJBK2.

W6x20 @ 4'-0"
NO SEISMIC

CASE F axial (N) M (N-M) ELEM. NO

1 163,300 4,888 12

2 160,800 5,458 11

3 196,500 3,627 10

F axial (K) M (F-K)

1 $36.71 * 1.22 = 44.79$ $3.61 * 1.22 = 4.40$ 2 $36.15 * 1.22 = 44.10$ $4.03 * 1.22 = 4.92$ 3 $44.18 * 1.22 = 53.90$ $2.68 * 1.22 = 3.27$ f_a f_b C

1 7.63 3.94 .435 + 0.192 = .627

2 7.51 4.41 .428 + .215 = .643

3 9.18 2.93 .523 + .145 = .668

all < 1.0 OK

$$F_e : K L_b / r_b = 32, F_e = 145.8$$

STEEL SET CALCULATION FOR
 DETERMINING JACK SIZE
 CHECK W8x31 FOR 30T JACK
 FROM COMPUTER OUTPUT FILE; STLRV 2
 LOAD COMBINATION 6 CORRESPONDS
 TO 30T JACKING LOAD -
 (SEE ATTACHMENT I, PAGE I-29 THRU I-34)

COMPUTER INTERACTION COEFF. FROM AISC

CODE CHECK = 0.892 @ MEMBERS 4, 41, 42 AND
 = 0.893 @ MEMBER 3

MEMBER	P _{max}	M _{max}
3	55.08	33.42 GOVERNS
4	54.91	33.42
41	54.95	33.38
42	55.10	33.38

MEMBER 3 IS CRITICAL

$$P = 55.08$$

$$M = 33.42$$

$$f_a = \frac{55.08}{9.13} = \frac{6.03 \text{ KSI}}{\quad} \quad \frac{f_b}{6} = \frac{33.42 \times 12}{27.5} = \frac{14.58 \text{ KSI}}{\quad}$$

UNBRACED LENGTHS

$$L_y = 88.29" = 35^\circ \text{ TIE ROD SPACING}$$

$$L_x = 3.5 \times 18.79" = 65.77"$$

(FROM MOMENT DIAGRAM, PAGE I-43)
FOR LOAD COMB. NO. 7 - ASSUME SIMILAR FOR L.C. NO. 6

ALLOWABLE STRESSES

TABLE C-36 AISC P. 3-16

$$\frac{K L_y}{r_y} = \frac{88.29}{2.02} = 43.71$$

$$F_y = 18.89 \text{ KSI}$$

$$\frac{K L_x}{r_x} = \frac{65.77}{3.47} = 18.95$$

$$F_e' = 338.62$$

AISC 5-4.5 F1-2

$$L_c = \frac{76 \text{ bf}}{\sqrt{F_y}} = \frac{76 \times 8}{6} = 101.33" \text{ GOVERNS}$$

$$L_c = \frac{20,000}{\frac{d}{A_f} F_y} = \frac{20,000}{2.3 \times 36} = 241$$

$$L_c = 101.33" > 65.67" = L_x$$

$$\therefore \text{FROM AISC 5-4.5 F1-1} \rightarrow F_b = \underline{24 \text{ ksi}}$$

$$(\approx .66 F_y) -$$

DETERMINE INTERACTION COEFFICIENTS

AISC 5-54, H1

$$H1-1 \quad \frac{6.03}{18.89} + \frac{14.58}{\left(1 - \frac{6.03}{338.62}\right) 24}$$
$$.319 + .619 = .938 < 1. \text{ but, too close.}$$

H1-2 DOES NOT GOVERN - BY INSPECTION

USE 25 TON JACK \pm 2 TON

HAND CALCULATIONS FOR 27 TON JACK

ARE NOT REQUIRED SINCE

ALL COMPUTER INTERACTION

COEFFICIENTS ARE LOWER

SEE ATTACHMENT I -

SUMMARY OF COMPUTER ANALYSES

FOR JACKING LOADS -

STEEL SET CALCULATIONS FOR 25^T JACKING WITHOUT FOOT SEGMENTS.

1) ST2RV4C - MEMBER 3 GOVERNS
SEE ATTACHMENT I, PAGE I-163 THRU I-171
 $F_{axial} = 45.84^K$ $M = 27.95^{11K}$

$$L_y = 88.29" = 35^\circ \text{ TIE ROD SPACING}$$

$$L_x = 3.5 \times 18.79" = 65.77"$$

(FROM MOMENT DIAGRAM)
ATTACHMENT I, PAGE I-170

$$\frac{K L_y}{r_y} = \frac{88.29}{2.02} = 43.71 \rightarrow F_a = 18.89^{KSI}$$

$$\frac{K L_x}{r_x} = \frac{65.77}{3.47} = 18.92 \rightarrow F_c' = 338.62^{11K}$$

$$F_b = 21.6$$

$$f_a = \frac{45.84}{9.13} = 5.02$$

$$f_b = \frac{27.95 \times 12}{27.5} = 14.76$$

$$\frac{5.02}{18.89} + \frac{12.20}{\left(1 - \frac{5.02}{338.62}\right) 21.6} = .266 + .573 = .839 < 1.0 \text{ OK}$$

2) STLRV3A2 *25^{TON} JACKING BOTH ENDS @ 47' MEMBERS 3#42 GOVERN
 SEE ATTACHMENT I, PAGE I-108 THRU I-119
 $M = 25$ K

$$F_{axial} = 60.65^k$$

$$f_a = \frac{57.94}{9.13} = 6.64^k$$

$$f_b = \frac{25 \times 12}{27.5} = 10.91^k$$

AMSC 5-54 - H1-1.

$$\frac{6.64}{18.89} + \frac{10.01}{\left(1 - \frac{6.64}{251}\right) 21.6} = 1.352 + 1.473 = 1.825 < 1.0 \text{ --- O.K.}$$

W6X20 STEEL SET @ 1.8 m (6 ft) SPACING:

FLAC Runs for a W6x20 steel set at 1.83 meter (6 ft) spacing using Welded Wire Fabric (WWF) and no lagging for Support Class I and Rock Property Category 5 (Ref 5.20, Table 14) produced the following max. reaction forces per meter in the steel sets (values from Ref 5.20, Pages 283-286):

Load Case	Axial (N)	Moment (N-m)	Shear (N)	Axial ¹ (kip)	Moment ² (kip-ft)	Shear ¹ (kip)
Static	7762	5585	24770	3.19	7.53	10.18
Dynamic	9670	5580	24560	3.97	7.53	10.09

Footnotes:

¹ N x 6 ft spacing / 3.2808 ft/m x .0002248 kip/N = N x .000411 = Force (kip)

² N-m x 6 ft spacing / 3.2808 ft/m x .0007376 k-ft/N-m = N-m x .001349 = Moment (k-ft)

By inspection, the maximum values from the above table will result in interaction values less than unity since the combined axial forces and moments are less than the combined axial forces and moments used from the worst case W6x20 static & seismic load calcs of Attachment III.A (Pages III-18 & 23) and the jacking loads of Attachment VIII (Page VIII-2). Therefore, the W6x20 at 6 ft spacing with WWF (no lagging) is adequate for the above rock load reaction forces from Ref 5.20.

PURPOSE III. B.STEEL SET LAGGING CALCULATION.

FROM: ESF GROUND SUPPORT DESIGN-
ANALYSIS

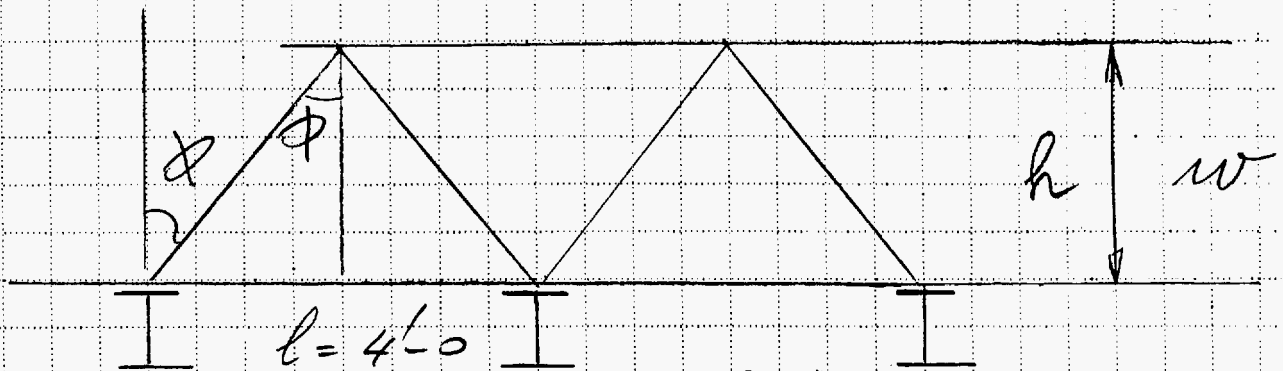
BABEE0000-01717-0200-00002, REV.00 (REF. 5,20)

The following data are available

UNIT	MEAN DENSITY		MINIMUM - FRICTION ANGLE ϕ
	Kg/m ³	#/ft ³	
TCW	2150	134	53°
PTW	1299	81	40°
TSW1	2162	135	41°
TSW2	2274	142	49°

THE MINIMUM FRICTION ANGLE IS USED
because a larger angle will give
a smaller value for W (SEE LOAD DIAGRAM)
NEXT PAGE

BY INSPECTION TSW1 OR TSW2
WILL DETERMINE THE LARGER W



NOTE: $l + \text{CONSTRUCTION TOLERANCE} = l \pm 2' = 4.33' \text{ MAX.}$
EFFECT OF TOLERANCE ON DESIGN IS FACTORED IN f_b

$$w = R * \text{DENSITY (D)}$$

$$\frac{2'}{h} = \tan \phi$$

FOR TS W 1

$$\frac{2'}{h} = \tan 41^\circ = .8692867$$

$$R = \frac{2'}{.8692867} = 2.3'$$

$$w = 2.3' * D = 2.3' * 140 = \underline{\underline{322}} \quad \# / \text{ft}$$

$$(D = 135 \# / \text{cu ft} \rightarrow = 140 \# / \text{cu ft FOR BOUNDING})$$

FOR T_{SW2}

$$\frac{z'}{h} = \tan 49^\circ = 1.15$$

$$h = \frac{z'}{1.15} = 1.74'$$

$$W = 1.74 * D = 1.74 * 145 = \underline{252} \text{ #/ft}$$

($D = 142 \text{ #/ft}^3$ - USE 145 #/ft^3 FOR BOUNDING.)

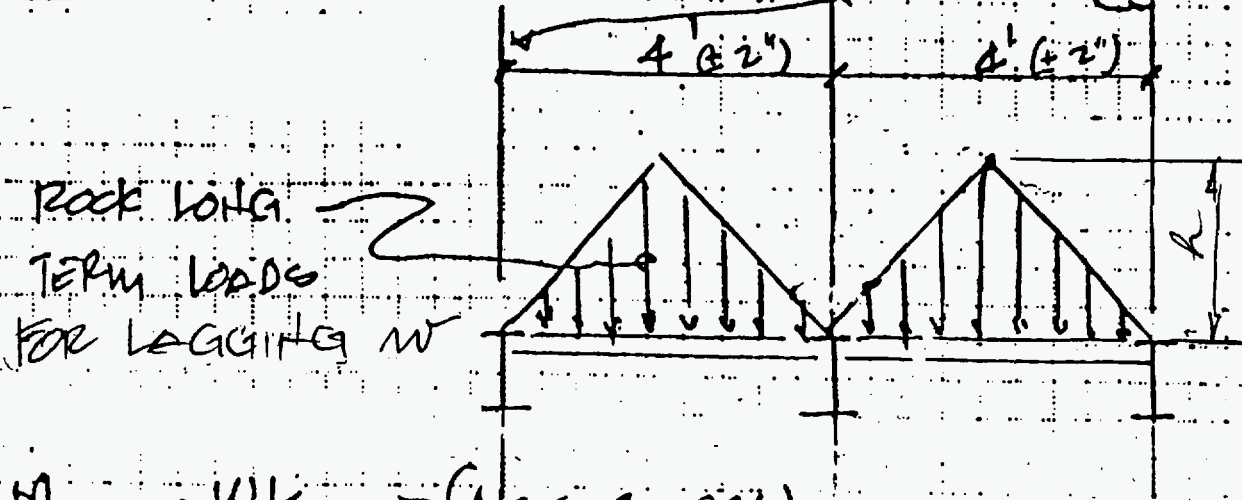
$$W = \underline{322} \text{ #/ft GOVERNS -}$$

CALCULATE MOMENT AND SHEAR

IN LAGGING MEMBER WITH $W=322$

DESIGN STEEL LAGGING

E-STEEL SEIS



$$M_{max} = \frac{WL}{6} \rightarrow (A \text{ SC } 2 - 246)$$

 $\alpha = \text{ROCK DENSITY}$
 $h = \text{RAVELING ROCK HEIGHT}$

$$W = h \times \Delta ; W = 2.3' \times 140 = 322 \text{ \# / l'}$$

$$W = \frac{322(4)}{2} = 644$$

$$M_{max} = \frac{644(4)}{6} = 429 \text{ FT-LB}$$

$$V = R = \frac{W}{2} = \frac{644}{2} = 322 \text{ \#}$$

TRY STANDARD COLD FORMED SECTION
WITH GAGE 7 METAL

$$GAGE 7 = t = 0.1793 \text{ IN (CONSTRUCTION)}$$

STANDARD PRACTICE OR RECOMMENDATION

$$A_1 = 0.1793(8) \quad \bar{y}_1 = 0.1793$$

$$A_2 = 0.1793(2) \quad \bar{y}_2 = \frac{1}{2}(2 - 0.1793) + 0.1793 = 1.09$$

$$A_2 = 0.653$$

$$\bar{y} = \frac{A_1 \bar{y}_1 + A_2 \bar{y}_2}{A_1 + A_2}$$

$$\bar{y} = \frac{0.1793(8) \left(\frac{0.1793}{2}\right) + 0.653 \times 1.09}{0.1793(8) + 0.653}$$

$$\bar{y} = \frac{0.84}{2.087} = 0.403"$$

$$I_y = \left[\frac{(0.1793)^3 (8)}{12} + 0.1793(8) \left(0.403 - \frac{0.1793}{2}\right)^2 \right] +$$

$$\left[\frac{(2 \times 0.1793)^3 (0.1793)(2)}{12} + 0.1793(2 \times 2) (1.09)^2 \right]$$

$$= 0.0038 + 0.141 + 0.18 + 0.7757$$

$$= 1.1 \text{ in}^4$$

$$f_{by} = 21,600 \text{ psi} \quad \text{ALLOWABLE (F2-2 AISC)} \quad \text{(WORST CASE: LAGGING WILL BE INSTALLED CONTINUOUS ON THE ENTIRE STEEL SET)}$$

$$f_b = \frac{M c}{I_y}$$

$$c = 2 - 0.403 = 1.6"$$

429 FT-LB IS PER ONE FOOT. BENT R IS 8" WIDE.

$$M_y = \text{MOMENT IN } \square \text{ PLATE}$$

$$= 429 \left(\frac{8}{12}\right) = 286 \text{ FT-LB}$$

$$f_{b1} = \frac{286 (1.6)(12)}{1.1 \times \left(\frac{4.33}{4}\right)} = 5404 \text{ psi} < 21,600 \text{ psi}$$

∴ GAGE T IS O.K.

TRY C 8 X 11.5 (ASTM A36)

$$t_w = 0.22" \quad S_y = 0.781 \text{ in}^3 \quad (\text{AISC p1-40441})$$

$$f_{b1} = \frac{M}{S_y} = \frac{286 \times 12}{0.781} \times \left(\frac{4.33}{4}\right) = 4,757 \text{ psi}$$

$$f_{b1} < 21,600 \text{ psi}$$

CHECK CONNECTION DETAIL $\frac{8}{IX-12}$, ATTACHMENT IX, Option-1, p. IX-12

a. CHECK CARRIAGE BOLT ~

$$T = \text{MAX. BOLT TENSION} \\ = 322 \text{ lb} \text{ --- D.L.}$$

$$T_a = \text{ALLOWABLE BOLT TENSION} \\ = 20 (0.142 \text{ IN}^2 \text{ TENSILE STRESS AREA}) \\ = 2.8 \text{ K} \text{ --- AISC 5-73 \& 4-147}$$

$$\gg T = 0.322 \text{ K} \text{ --- O.K.}$$

USE $\frac{1}{2}$ " ϕ A307 BOLT MINIMUM.

b. CHECK CLIP PLATE ~

TRY PLATE SIZE 6" x 3" x t

$$S_x = \text{SECTION MODULUS AT CRITICAL SECTION} \\ = (3" - \frac{1}{4}" \phi \text{ HOLE}) \times (t)^2 / 6 = 0.406 t^2$$

$$M = \text{MAX. MOMENT} \\ = T \times 6" / 4 = 0.322 \times 6 / 4 = 0.483 \text{ K}$$

$$S_x = \frac{M}{F_b}, \quad F_b = 0.75 F_y = 27 \text{ KSI --- AISC F2-1}$$

$$0.406 t^2 = \frac{0.483}{27}$$

$$t = 0.211" \text{ USE } \frac{1}{2}"$$

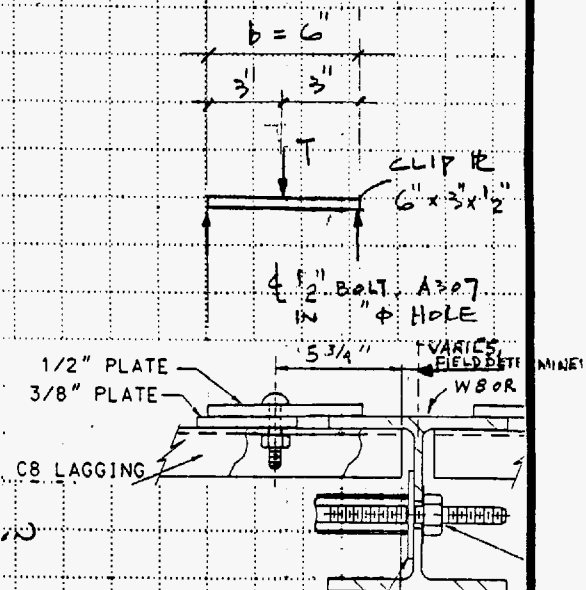
c. CHECK CB WEB ~

$$\text{NUT PERIMETER} \cong 4 \times (\frac{3}{4}) = 3"$$

$$V = \text{SHEAR IN CB WEB} = \frac{0.322 \text{ K}}{3 \times 0.22} = 0.488 \text{ KSI}$$

$$V_a = \text{ALLOWABLE SHEAR} = 0.4 F_y \text{ --- AISC 5-49}$$

$$= 14.4 \text{ KSI} \gg 0.488 \text{ KSI} \text{ --- O.K.}$$

USE 6" x 3" x $\frac{1}{2}$ " CLIP PLATE $\frac{1}{2}$ " ϕ CARRIAGE BOLT, A307 AND ASME B 18.5 $\frac{3}{8}$ " FILLER PL (COMPATIBLE WITH WB x 31 FLG) AS SHOWN IN DETAIL $\frac{8}{IX-12}$ 

CHECK (INCLUDE SEISMIC)

$$S_v = 0.37W \text{ (TBV-193)} \text{ --- (REF. 5.16, APPENDIX A.5)}$$

$$S_v = 0.37 (644) = 238 \text{ lb}$$

$$M = \frac{(644 + 238)4}{6} = 588 \text{ FT-LB/PER FT.}, S_y = 2.78 \text{ IN}^2 \text{ (AISC 1-41)}$$

M_c = BENDING MOMENT IN CB

$$M_c = 588 \left(\frac{8}{12} \right) = 392 \text{ FT-LB}$$

$$\therefore f_b = \frac{392 (12)}{0.781} \times \left(\frac{4.33}{4} \right) = 6,522 \text{ psi} = 6.52 \text{ ksi} < 27.0 \text{ ksi} \times 1.33$$

USE C8 X 11.5 FOR LAGGING

AND FILLER PLATE $3/8" \times 4" \times 4"$

USE $9/16"$ SQUARE HOLES IN $1/2"$ AND $3/8"$ PLATES
W/ SLOTTED HOLE IN CB - FOR TOLERANCE
ADJUSTMENT

T_2 = BOLT TENSION WITH SEISMIC

(PAGE III-35)

$$T_2 = 322 (1.37) \left(\frac{8}{12} \right) \times \left(\frac{4.33}{4} \right) = 318 \text{ lb} = 0.318 \text{ K} < T_a = 2.18 \text{ K} \times 1.33$$

f_{b2} = BENDING STRESS WITH $1/2"$ PLATE & $w = 3"$

$$S = \frac{(3 - 9/16) t^2}{6} = \frac{2.44 (0.5)^2}{6} = 0.102 \text{ IN}^3$$

$$f_{b2} = \frac{3/8 \text{ lb} \times 3}{0.102} = 9352.9 \text{ psi} = 9.35 \text{ ksi} < 27.0 \text{ ksi} \times 1.33$$

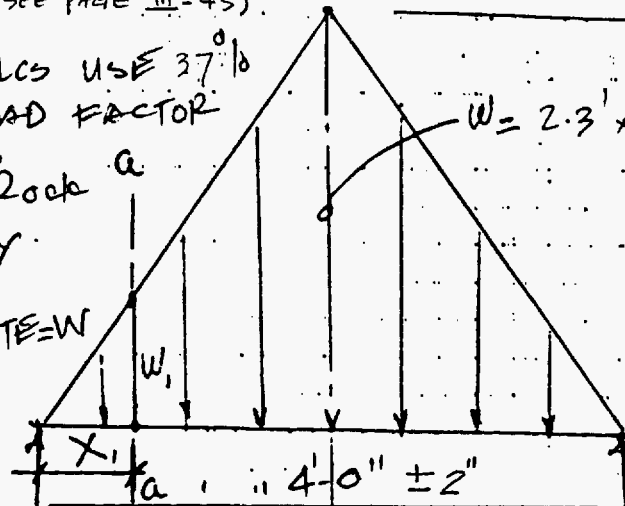
$1/2"$ DIA BOLT AND $1/2"$ PLATE IS OK

Option-2 (p. III-44) is Constructor's option and subject to A/E review. For Option-3 see Attachment IX, p. IX-12 & 45. CALCS FOR OPTION-3 (LAGGING CONNECTION TO STEEL SET) (SEE PAGE III-45)

FOR THIS CALCS USE 37% SEISMIC LOAD FACTOR

$\alpha = 140 \text{ lb/ft}^3$ - Rock DENSITY

LOAD ORDINATE = W



LOAD DIAGRAM

TRIAL DIMENSIONS.

$$140 \times 1.37 = 191.8$$

$$W = 2.3' \times 140 \times 1.37 = 2.3 \times 168$$

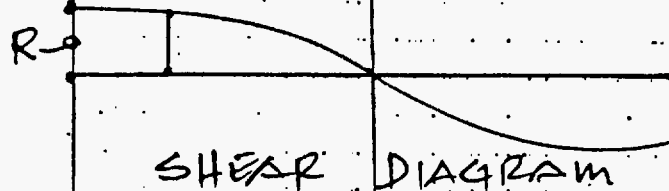
$$= 441 \text{ lb/ft}$$

WITH SEISMIC

$$W = 4.41 \times 4$$

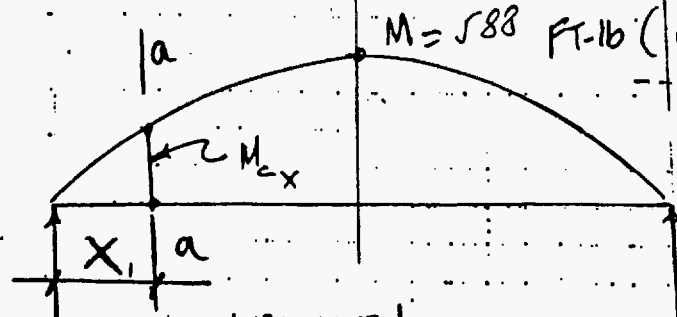
$$= 88.2 \text{ lb/ft}$$

$$R = \frac{88.2}{2} = 44.1$$



SHEAR DIAGRAM

$R = 44.1 \text{ lb/ft}$ (WITH SEISMIC)



MOMENT DIAGRAM

$M = 588 \text{ FT-LB}$ (WITH SEISMIC)

PG III-36

$$t_w = .22" \text{ (AISC 1-40)}$$

X = DISTANCE FROM EDGE OF BEARING AREA OF CB SET. TO BENDING MOMENT CRITICAL SECTION OF THE COPE (a-a).

M_{c_x} = BENDING MOMENT ON CB AT CRITICAL SECTION.

S_6 = SECTION MODULUS AT CRITICAL SECTION FOR COPE AT THE WEB (ALTERNATE 1)

S_8 = SECTION MODULUS AT CRITICAL SECTION FOR COPE AT FLANGES (ALTERNATE 2)

CONSIDER CRITICAL CASE BY LETTING BOLT HOLE AT CRITICAL SECTION.

$$S_6 = \frac{(6 - \frac{3}{4})(t)^2}{6} = \frac{5.25 \times (0.22)^2}{6} = 0.0424 \text{ in}^3$$

$$S_8 = \frac{(8 - \frac{3}{4})(t)^2}{6} = \frac{7.25 \times (0.22)^2}{6} = 0.0585 \text{ in}^3$$

CHECK BENDING STRESS AT CRITICAL SECTION FOR THE FOLLOWING:

VALUE OF X

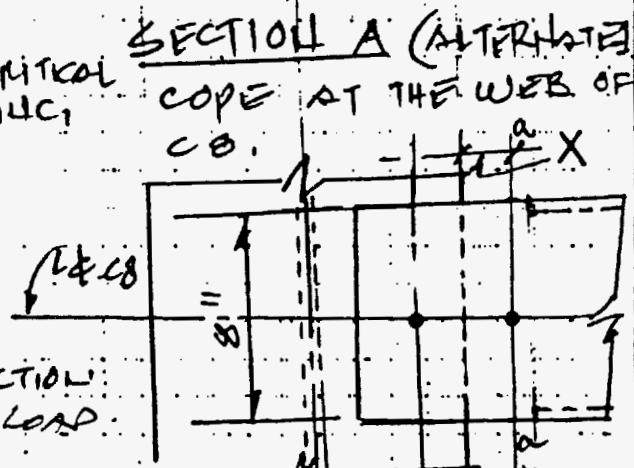
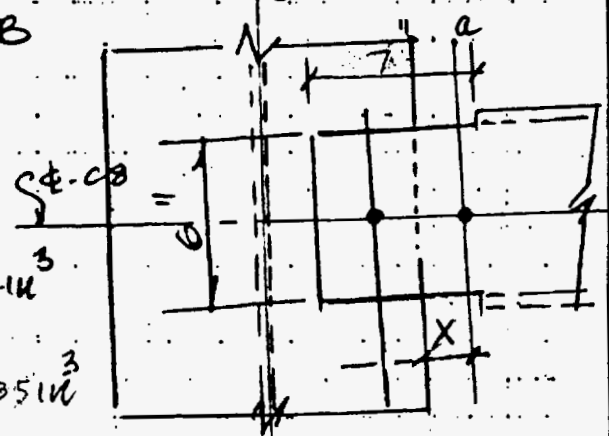
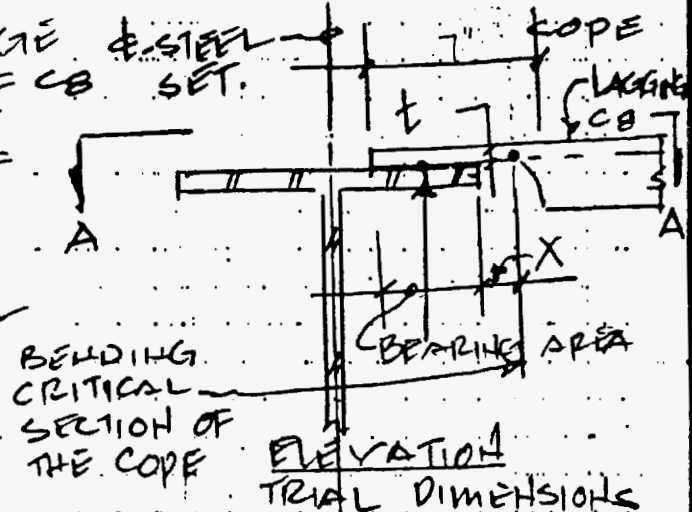
$$X = 3", X = 3\frac{1}{2}", X = 4"$$

$$\text{AND } X = 7 - \frac{3}{4} = 6.25"$$

W_1 = LOAD AT CRITICAL SECTION OF THE COPE. SEISMIC LOAD.

$$\text{IF } X = 3" = 0.25'$$

$$W_1 = \frac{2.3(19.8)(0.25)}{2} = 55 \text{ lb/ft}$$



SECTION A (ALTERNATE 2) COPE AT THE FLANGES OF CB

$$\text{IF } X = 3\frac{1}{2}'' = 0.29'$$

$$W_1 = \frac{2.3(191.8)}{2} (0.29) = 64 \text{ lb}$$

$$\text{IF } X = 4'' = 0.33'$$

$$W_1 = \frac{2.3(191.8)}{2} (0.33) = 72.8 \text{ lb}$$

$$\text{IF } X = 6\frac{1}{4}'' = 0.521'$$

$$W_1 = \frac{2.3(191.8)}{2} (0.521) = 114.88 \text{ lb}$$

$$EM_{a-a} = 0$$

$$M_{c3} = \left[441(3) - \frac{55(3)(\frac{3}{2})}{2} \right] \frac{8}{12}$$

$$= 827 \text{ in-lb}$$

$$M_{c3\frac{1}{2}} = \left[441(3.5) - \frac{64(3.5)(\frac{3.5}{2})}{2} \right] \frac{8}{12}$$

$$= 942.0 \text{ in-lb}$$

$$M_{c4} = \left[441(4) - \frac{72.8(4)(\frac{4}{2})}{2} \right] \frac{8}{12}$$

$$= 1046.6 \text{ in-lb}$$

$$M_{c4\frac{1}{2}} = \left[441 \times (6.25) - \frac{114.88(6.25)(\frac{6.25}{2})}{2} \right] \frac{8}{12}$$

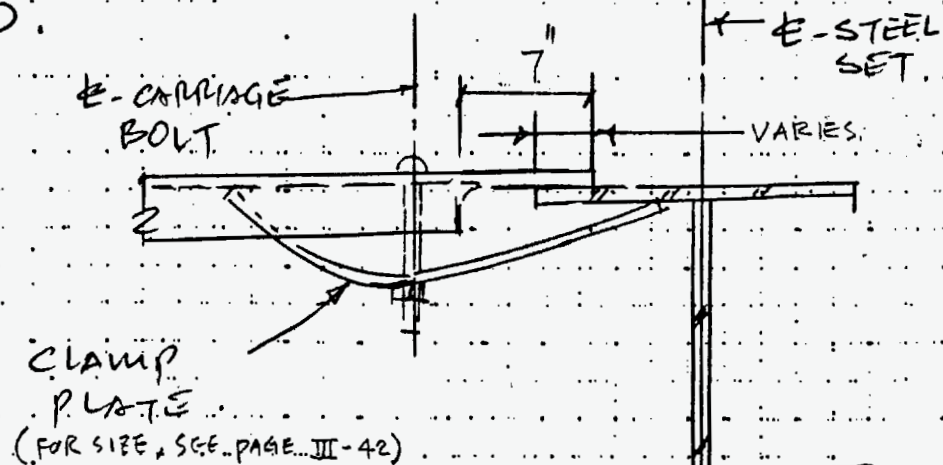
$$= 2008.3 \text{ in-lb}$$

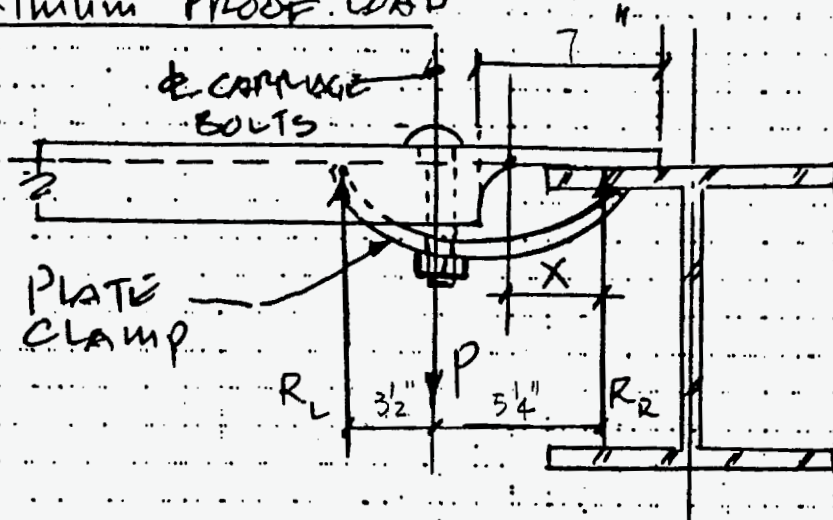
CALCULATE BENDING STRESS AT CRITICAL SECTION & USE 0.75 F_y FOR ALLOWABLE STRESS AISC (F2-1)

C8 x 11.5		BENDING STRESS @ CRITICAL SECTION $\frac{M}{S}$	
X	$M_{C X}$	SECTION 6" COPE AT WEB $S_x = 0.0424 \text{ in}^3$	SECTION 8" COPE AT FLANGES $S_x = 0.0585 \text{ in}^3$
3"	827 in-lb	19.5 ksi $< 1.33 \times 0.75 F_y = 35.9$	14.14 ksi $< 1.33 \times 0.75 F_y = 35.9$
3 1/2"	942 in-lb	22.2 ksi $< 1.33 \times 0.75 F_y$	16.1 ksi $< 1.33 \times 0.75 F_y$
4"	1046.6 in-lb	24.7 ksi $< 1.33 \times 0.75 F_y$	17.9 ksi $< 1.33 \times 0.75 F_y$
6 1/4"	2008.3 in-lb	47.4 ksi $> 1.33 \times 0.75 F_y$	34.3 ksi $< 1.33 \times 0.75 F_y$ *
		--- N.G.	--- O.K.

* USE C8 x 11.5 WITH 7" MAX COPE AT THE FLANGES AND SHALL BE INSTALLED AS SHOWN BELOW.

FOR SAFETY DURING CONSTRUCTION OF THE LAGGING A CLAMP PLATE IS REQUIRED.



CHECK MAXIMUM PROOF LOAD

P = PROOF LOAD THAT
CRITICAL SECTION
CAN WITHSTAND.

CLAMP DETAIL
TRIAL DIMENSIONS.

$$\sum M_{R_L} = 0$$

$$\sum R_R = 3P$$

$$R_R = 0.375P$$

$$M_{MAX} = R_R (5\frac{1}{4})$$

MAX. BENDING MOMENT IN CHANNEL AT CRITICAL
SECTION OF THE CHANNEL.

$$= 0.375P(5.25) = 1.97P \text{ in-lb}$$

$$F_b = 27.0 \frac{\text{ksi}}{1} = 0.75 F_y \text{ ALLOWABLE BENDING STRESS}$$

$$F_b = \frac{M_{MAX}}{S_b} = 27,000 \text{ psi (AISC F21, P. 5-48)}$$

$$27,000 = \frac{1.97P}{0.0585}$$

$$P = 8,018 \text{ lb}$$

$$\therefore M_{MAX} = 1.97(8,018) = 15,795 \text{ in-lb}$$

FROM PREVIOUS PAGE, IT DEMONSTRATES THAT BOLT TENSION IS LIMITED TO 1579.5^{lb}. TO ENSURE THAT THE BENDING IN CLAMP PLATE IS WITHIN ALLOWABLE, THE CARRIAGE BOLT SHALL BE SNUG TIGHT AND NOT BE TIGHTENED TO A BOLT PRETENSION.

THE CLAMP PLATE STIFFNESS SHALL NOT EXCEED THE STIFFNESS OF C8 CRITICAL SECTION SO THAT THE BACK OF CHANNEL WILL NOT BEND AWAY FROM ROCK SURFACE.

$$\text{TRY } 3/16 \times 8 \times 3$$

$$I = \frac{3 \times \left(\frac{3}{16}\right)^3}{6}$$

$$= 0.0176 \text{ in}^4$$

$$f_b = \frac{M_{3/16}}{I_{3/16}}$$

$M_{3/16}$ = MOMENT CAPACITY FOR CLAMP PLATE

$$27,000 = \frac{M_{3/16}}{0.0176}$$

$$M_{3/16} = 475.0 \text{ in-lb}$$

$$M_{3/16} < M_{c4}$$

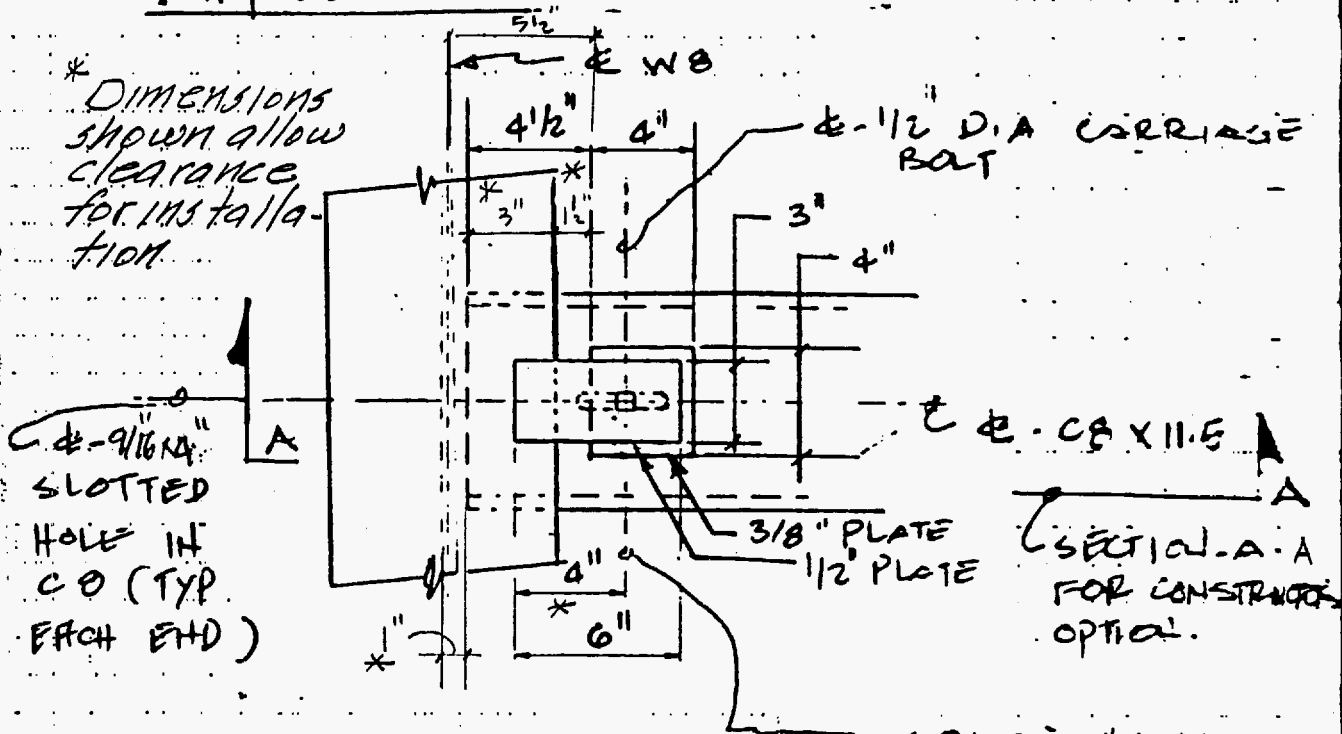
$$\text{RATIO} = \frac{1579.5}{475.0} = 3.3 \text{ ok}$$

USE CURVE $3/16 \times 8 \times 3$ PLATE, OPTION-3

OR 8×3 PIECE CUT FROM 20" ϕ SCH 10 PIPE
(WALL THICKNESS = 0.25")

SUMMARYPURPOSE - III.B

* DIMENSIONS
SHOWN ALLOW
CLEARANCE
FOR INSTALLA-
TION.



SQUARE HOLES

IN 42' & 3/8" PLATE

C 8 X 11.5, 1/2" AND 3/8" PLATES SHALL BE
IN ACCORDANCE WITH ASTM A36

1/2" CARRIAGE BOLT SHALL BE IN
ACCORDANCE WITH ASTM A307 AND
ASME-B 18.5

OPTION - 1 (p. III-35)

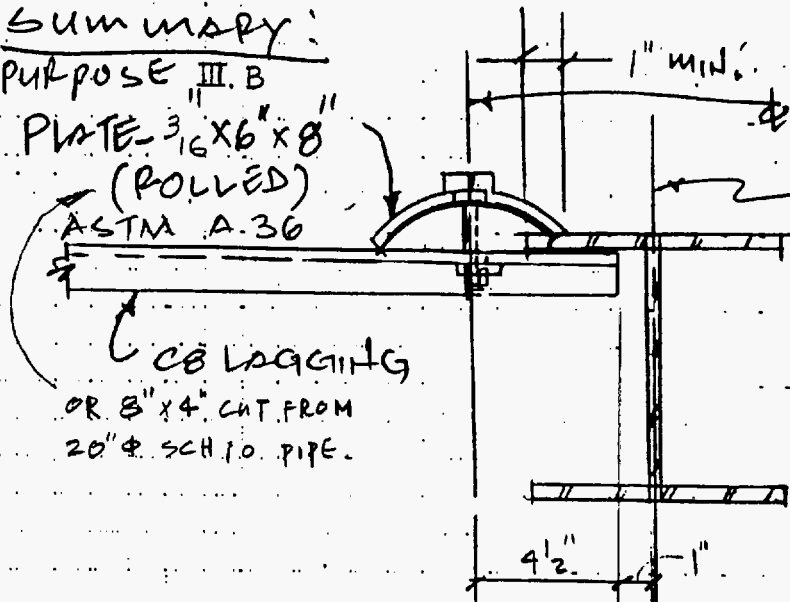
Summary:

PURPOSE III. B

PLATE - 3/16" X 6" X 8"

(ROLLED)

ASTM A-36



1/2" DIA CARRIAGE BOLTS - ASTM A307 &

E-W8X31 ASME B18.5

CB LAGGING

OR 8" X 4" CUT FROM

20" SCH 10 PIPE.

SECTION - A - A

(CONSTRUCTOR OPTION)

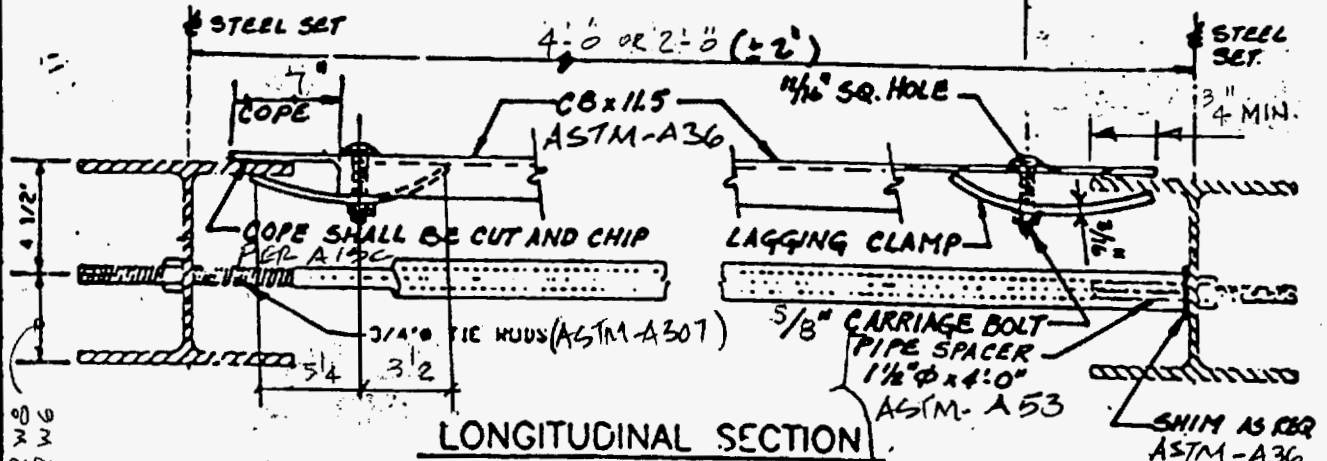
CONSTRUCTORS SHALL SUBMIT SHOP DRAWINGS FOR THIS OPTIONAL - 2 OF LAGGING AND PLATE CONNECTION AND SHALL BE REVIEWED BY THE A/E.

OPTION - 2 (P. III-37)

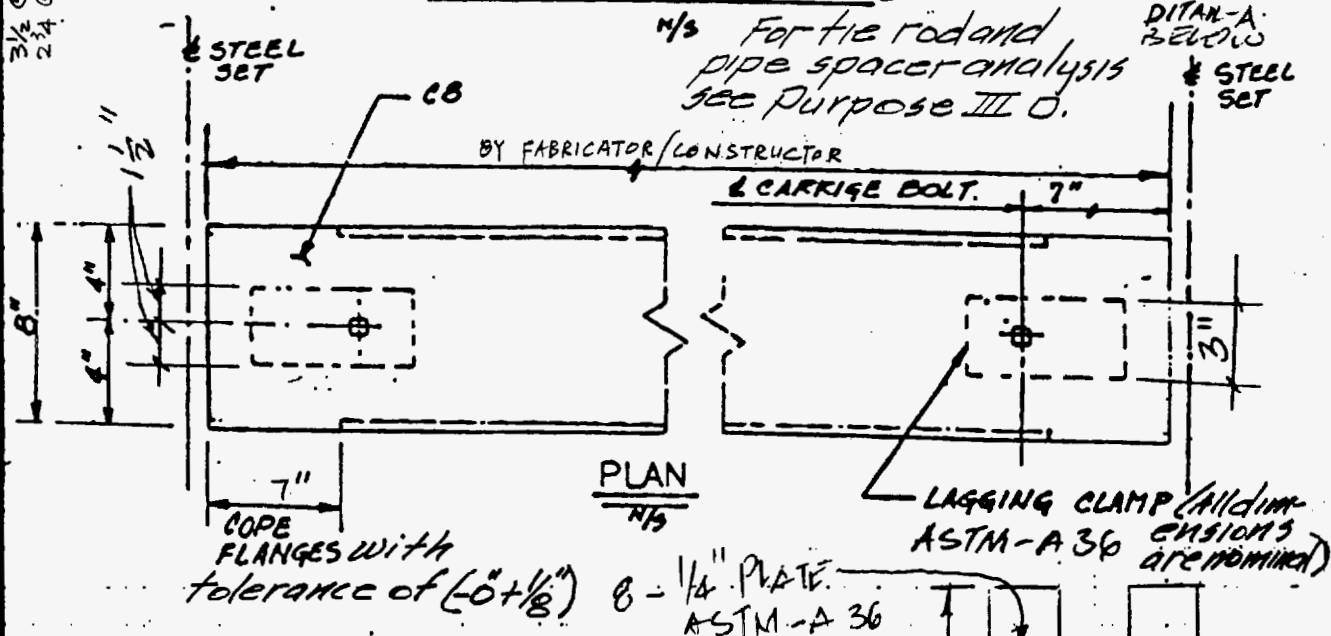
SUMMARY -
PURPOSE III.B

B. CARRIAGE
BOLT

CARRIAGE BOLTS
ASTM-A307
AND ASME-B18.5



N/S For tie rod and
pipe spacer analysis
see Purpose III C.



OPTION - 3 (p. III-37)

Note: For this option
lagging clamp, carriage
bolt, nut and washer
are classified QA: NONE.

III-40, III-41 &
III-42

(see p. III-62)

DET. A

PURPOSE III.C A) JACKING BRACKET ASSEMBLY CALCULATION FOR W8x31 STEEL SETS

DESIGN JACKING BRACKET: (25 TON Jack CAPACITY)
DESIGN FOR 27 TON FORCE.

1. DESIGN OF CONNECTION BOLTS TO STEEL SET:

JACKING BRACKET SHALL BE
REMOVED AFTER
A COMPLETE RING OR
SEGMENTS ASSEMBLY OF
STEEL SET IS IN PLACE.

TRY 8 - 1" A307 BOLTS
(SEE AISC 4-3 & 4-5)

T_a = ALLOWABLE BOLT TENSION

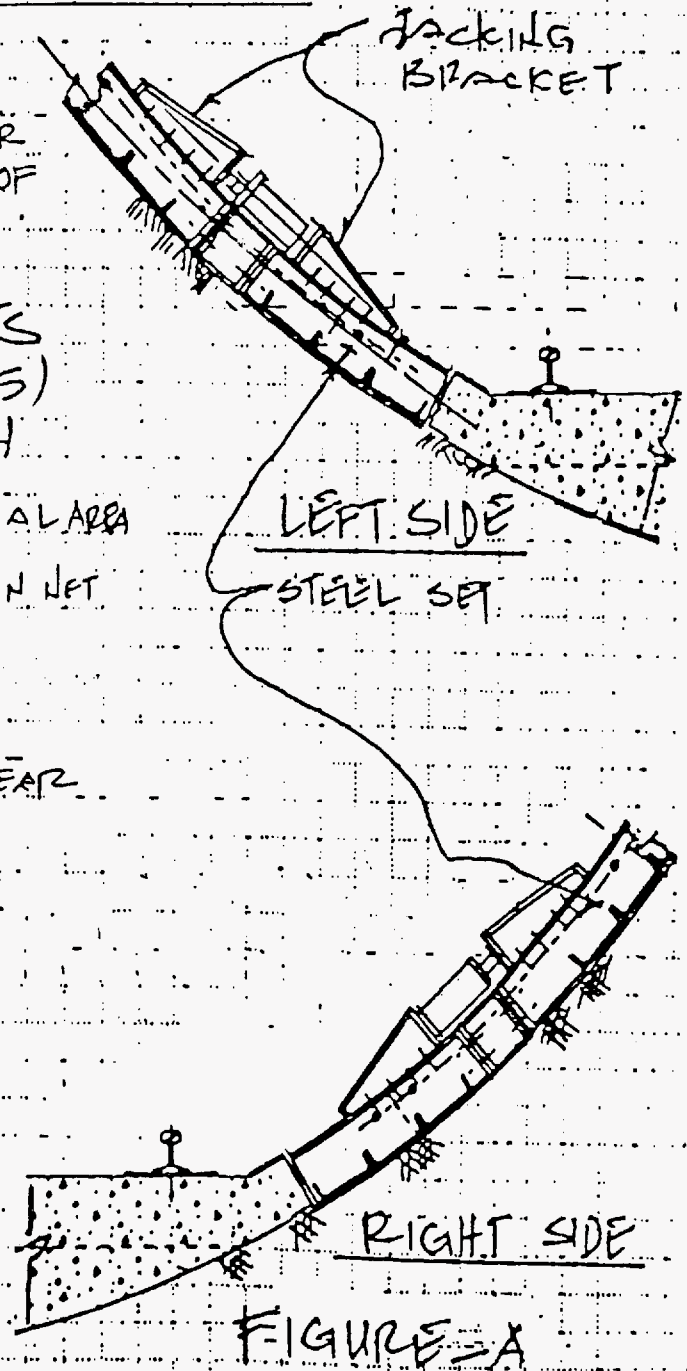
$$= 15.70^k \rightarrow \text{TENSION ON NOMINAL AREA}$$

$$\text{OR } 20(600) = 12.12^k \text{ TENSION ON NET AREA - AISC 4-147}$$

$$\therefore \text{USE } T_a = 12.12^k \text{ ALLOWABLE}$$

V_a = ALLOWABLE BOLT SHEAR

$$V_a = 7.9^k - \text{AISC 4-5}$$



a = 1/2 JACK BODY DIAMETER -- ATTACHMENT VI
= 1 11/16" USE 2"

DESIGN CAPACITY $= P_f = 54k$

M = MOMENT ON THE BRACKET

$$M = 54(2) = 108 \text{ in-k}$$

$V_a = 6 \text{ HEAR FORCE ON EACH BOLT}$

$$r_a = \frac{54}{8} = 6.75 \text{ k/BOLT}$$

T_a = TENSION ON THE TOP MOST BOLT

$$T_a = \frac{Mc_1}{I}$$

$\frac{I}{c} = 4.5$

$$I = 4.5 \cdot c$$

$$I = 4.5 \cdot 0.7854 = 3.53$$

$$\Sigma \bar{c}^2 = (1.5^2 + 4.5^2) = 22.50 \text{ m}^2$$

$$I = 4 [I_c + A \Sigma \bar{c}^2]$$

$$I = 4[0.049 + 0.7854(22.9)]$$

$$= 70.88 \text{ in}^4$$

$$T_a = \frac{108(4.5)}{10.88} = 6.86 \text{ K FOR (2) BOLTS}$$

$= 3.43 \text{ K/PER BOLT} < 12.12 \text{ --- O.K.}$ SECTION A-A
(SEE NEXT PAGE)

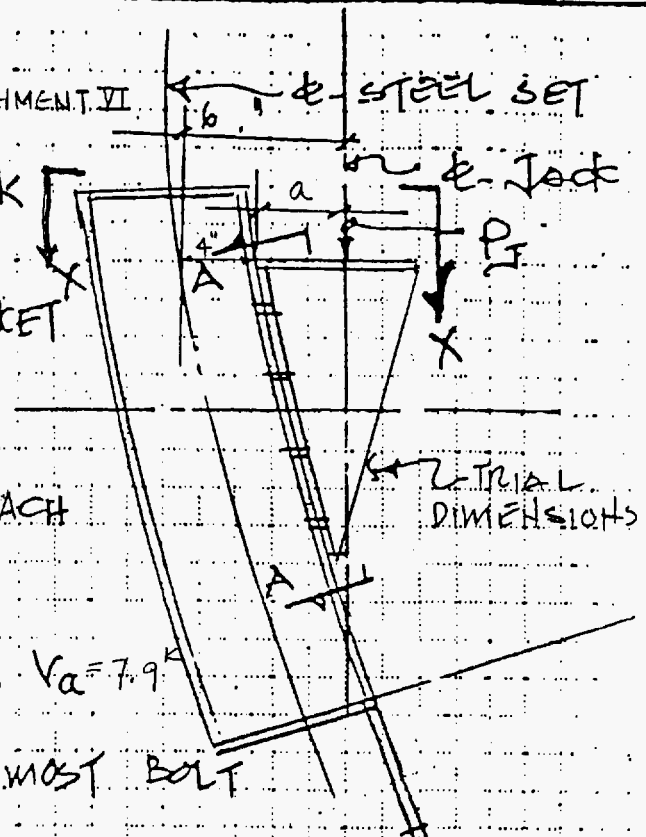
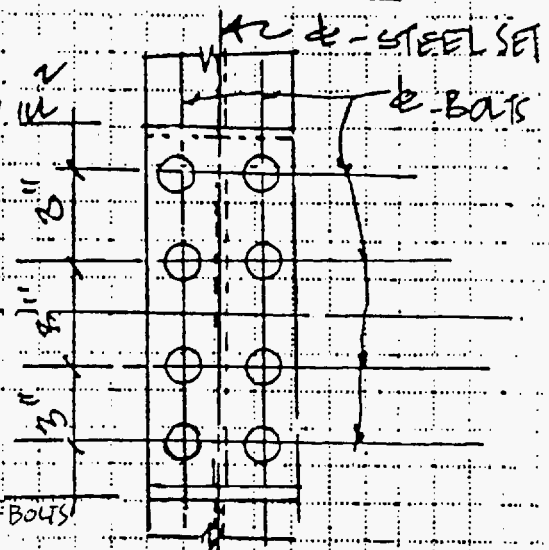


FIGURE-B



SECTION A-A

$$V_a = 7.9^k \text{ --- AISC 4-3}$$

$$T = 20^{ksi} \times 0.606 = 12.12^k \text{ --- AISC 4-3 \& 4-147}$$

$$f_v = \frac{6.75^k}{0.7854} = 8.6^{ksi}$$

$$26 - 1.8 f_v = 10.5^{ksi} < 20^{ksi} \text{ --- O.K. (AISC 5-74, TABLE J3.3)}$$

USE 8-1" ϕ ASTM A307 (60,000^{PSI}) MINIMUM WITH ASTM A563,

GRADE DH HEAVY HEX NUTS AND ASTM F436 WASHERS, TYPE I,
UNLESS SHOWN OTHERWISE. ALL BOLTS SHALL BE SNUG TIGHT.

2. DESIGN OF JACK PLATE :

REPRESENTATIVE PARAMETERS

SHOWN ON SECT. X-X
For details of jack see SECTION A.1.5, Design
Inputs.

A_J = JACK CROSS SECTIONAL
AREA @ BASE

$$A_J = \frac{\pi (3^3)}{4} = 8.95 \text{ in}^2$$

P_p = PRESSURE FROM JACK ON
PLATE UNDER JACK
BASE

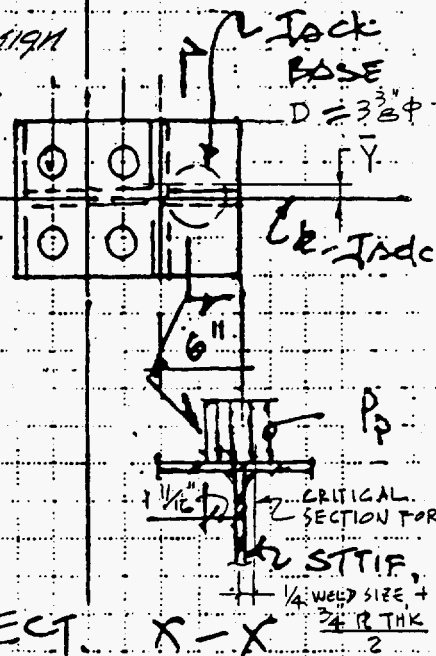
$$P_p = \frac{64}{A_J} = 6.04 \text{ ksi}$$

M_J = MOMENT IN TOP JACKING SECT. X-X
PLATE (6" STRIP) FROM FIG. B

$$= P_p \left(\frac{A}{2} \right) (\bar{y}) ; \bar{y} = R - R \left(1 - \frac{4}{3\pi} \right) = 0.72 \text{ --- (AISC 6-20)}$$

$$M_J = 6.04 \left(\frac{8.95}{2} \right) (0.72 - 0.25 - \frac{0.75}{2}) = 2.57 \text{ IN-K / 6" STRIP}$$

(ALTERNATE DESIGN
BY CONTRACTORS
OPTION.)



DETERMINE THICKNESS OF CAP PLATE,

t = THICKNESS OF CAP PLATE.

$$S = \frac{b \cdot t^2}{6} = \frac{6 \cdot t^2}{6} = t^2$$

$$S = \frac{M_J}{F_b}$$

$$t^2 = \frac{M_J}{F_b}$$

$$F_b = 0.75 F_y = 27 \text{ ksi} \quad \text{--- (AISC PAGE 5-48, F2-1)}$$

$$t^2 = \frac{2.57}{27} = 0.095''$$

$$t = 0.308''$$

USE $\frac{3}{4}''$ PL - HORIZONTAL PLATE FOR JACKING BRACKET.

DESIGN OF VERTICAL PLATE OF THE JACKING BRACKET(a) STIFFENER PLATE ~

WIDTH TO THICKNESS RATIO

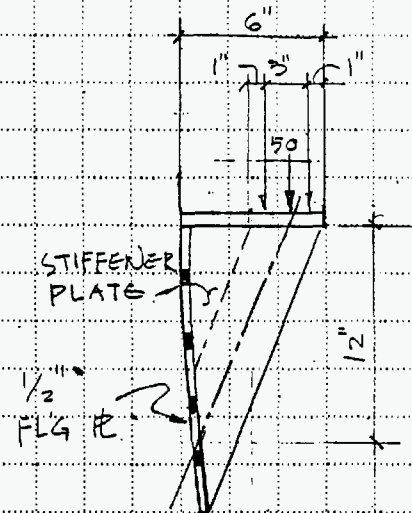
$$d/t \leq 127/\sqrt{F_y} \quad \text{--- (AISC, P 5-36)}$$

$$d = 6" \text{ MAX.}$$

$$t_{\text{MIN}} = \frac{d}{127/\sqrt{F_y}} = \frac{6}{21.17} = 0.283"$$

TRY $\frac{3}{4}"$ STIFFENER PLATE W/
 $\frac{1}{2}"$ FLANGE PLATE.

CHECK STIFFENER PLATE FOR JACK LOAD.

THE STIFFENER PLATE CAN BE IDEALIZED
AS A COMPRESSION ELEMENT. $\frac{3}{4}" \times 4" \times 12"$ LG

$$I_{\text{STIFF. PL.}} = \frac{4 \times (0.75)^3}{12} = 0.14 \text{ IN}^4$$

$$A = 0.75 \times 4 = 3.0 \text{ IN}^2$$

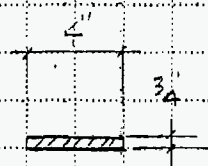
$$r = \sqrt{\frac{0.14}{3.0}} = 0.216$$

$$KL = \frac{3}{4} \times 12 = 9" \quad \text{--- EFFECTIVE LENGTH}$$

(AISC K1.8, PAGE 5-32)

$$KL/r = 9/0.216 = 41.67 \rightarrow F_a = 19.0 \text{ KSI} \quad \text{--- AISC, TABLE C-36}$$

$$P_a = 19.0 \text{ KSI} \times 3.0 = 57 \text{ K} > 54 \text{ K} \quad \text{--- O.K.}$$

USE $\frac{3}{4}"$ STIFFENER PLATE AS SHOWN.

(b) WELDING OF STIFFENER PLATE TO FLG PLATE OF JACKING BRACKET ~TRY $\frac{1}{4}$ " FILLET WELD $\sqrt{\frac{1}{4}}$ 14" LG.

$$A_w = \text{WELD AREA} = (2 \times \frac{1}{4}) (14) = 7 \text{ in}^2$$

$$M = 54 \text{ k} \times 4" = 216 \text{ in-k}$$

$$P/A = 54/7 = 7.71 \text{ ksi}$$

$$S_w = \frac{b d^2}{6} = (2 \times \frac{1}{4}) \times \frac{14^2}{6} = 16.33 \text{ in}^2$$

$$\frac{M}{S_w} = \frac{216}{16.33} = 13.23 \text{ ksi}$$

RESULTANT STRESS IN WELD

$$= [(7.71)^2 + (13.23)^2]^{1/2} = 15.3 \text{ ksi}$$

$$\text{ALLOWABLE WELD STRESS} = 0.3 \times 70 \text{ ksi} \text{ --- (AISC PAGE 5-70)}$$

$$= 21.0 \text{ ksi} > 15.3 \text{ ksi} \text{ --- O.K.}$$

MINIMUM SIZE OF FILLET WELD FOR BASE METAL PLATE OF $\frac{1}{2}$ TO $\frac{3}{4}$ " IS $\frac{1}{4}$ " WELD --- O.K. (AISC TABLE J2.4)USE $\sqrt{\frac{1}{4}}$ FILLET WELD E 70XX MINIMUM ELECTRODES.

(C) FLG # OF JACKING BRACKET IN CONTACT WITH WB X 31 FLG :

TRY 1/2" PLATE, ASTM A36 MATERIAL,

MIN. BOLT EDGE DISTANCE l

PARALLEL TO THE LINE OF

$$\text{FORCE} = 3'' > 1\frac{1}{2}d = 1.5''$$

AND BOLT SPACING.

$$= 3" \leq 3d = 3" \text{ (AISC P 5-75)}$$

ALLOWABLE BEARING

$$F_p = 1.2 F_u \quad \dots \text{AISC J3-1, P.5-74}$$

$$= 1.2 \times 58 \text{ ksi} = 69.6 \text{ ksi}$$

BEARING AREA

$$= 1'' \times \frac{1}{2}'' = 0.5'' \text{ IN}^2$$

SHEAR ON EACH BOLT

$$= \frac{54 \text{ k}}{8} = 6.75 \text{ k}$$

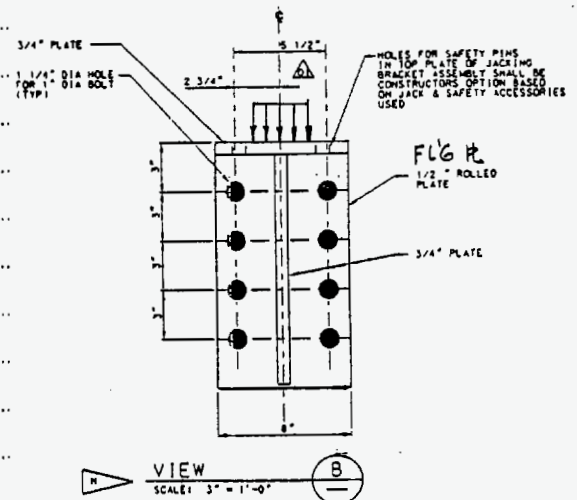
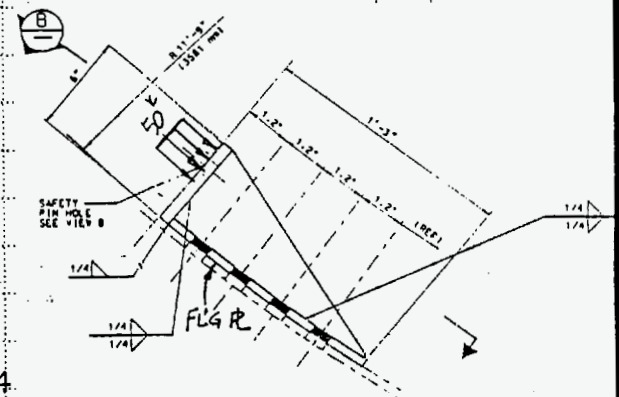
BEARING STRESS

$$= \frac{6.75}{0.5} = 13.5 \text{ ksi} < F_p = 69.6 \text{ ksi}$$

$$= 0.12$$

USE $\frac{1}{2}$ " FLG PLATE

ASTM A36 MATERIAL



PURPOSE III.C B) JACKING BRACKET ASSEMBLY CALCULATION FOR W6X20 STEEL SETS

DESIGN JACKING BRACKET : (15 TON JACK FORCE)1. DESIGN OF CONNECTION BOLTS TO STEEL SET : (DESIGN FOR 17 TONS)

JACKING BRACKET SHALL BE REMOVED AFTER A COMPLETE RING OR SEGMENTS ASSEMBLY OF STEEL SET IS IN PLACE.

TRY 6 - 1" A307 BOLTS
(SEE AISC 4-3 & 4-5)

T_a = ALLOWABLE BOLT TENSION

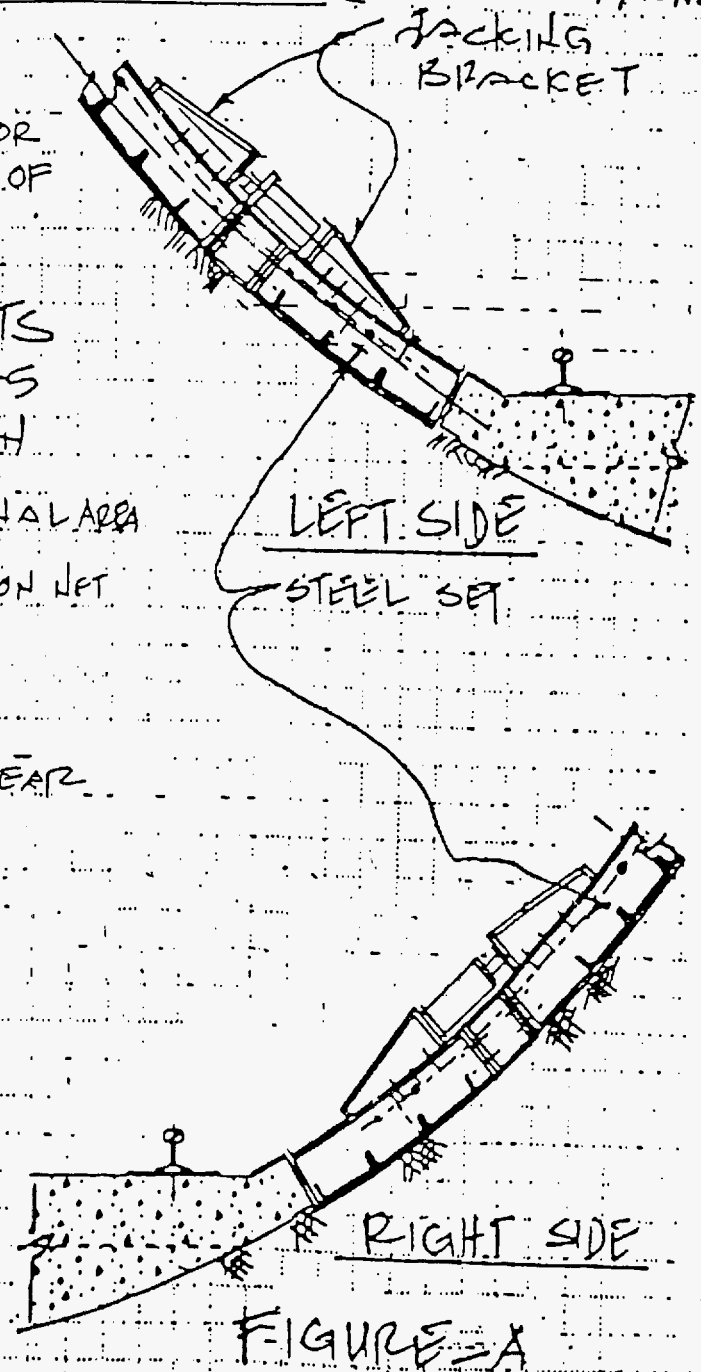
$$= 15.70^k \rightarrow \text{TENSION ON NOMINAL AREA}$$

$$\text{OR } 20(6006) = 12.12^k \text{ TENSION ON NET AREA - AISC 4-147}$$

$$\therefore \text{USE } T_a = 12.12^k \text{ ALLOWABLE}$$

V_a = ALLOWABLE BOLT SHEAR

$$V_a = 7.9^k - \text{AISC 4-5}$$



$a = \text{JACK TO W6 FLANGE}$
 $= \frac{1}{2} \text{ JACK BODY DIAMETER --- ATTACHMENT VI}$
 $= 1\frac{3}{8}" \text{ USE } 2"$

$$\text{DESIGN CAPACITY} = P_f = 34^k$$

$M = \text{MOMENT ON THE BRACKET}$

$$M = 34(2) = 68 \text{ IN-K}$$

$V_G = \text{SHEAR FORCE ON EACH}$
 BOLT

$$V_G = \frac{34}{6} = 5.67 \text{ K/BOLT}$$

$T_G = \text{TENSION ON THE TOP MOST BOLT}$

$$T_G = \frac{M c_1}{I}$$

$$c_1 = 3" \quad \left\{ \begin{array}{l} I_G = \frac{\pi}{4} (.5")^4 = 0.049 \text{ IN}^4 \\ A = 0.7854 \text{ IN}^2 \end{array} \right.$$

$$\bar{c} = (0.2 + 3.0) = 9.0 \text{ IN}$$

$$I = 2[I_G + A\bar{c}^2]$$

$$I = 2[0.049 + 0.7854(9.0)^2]$$

$$= 14.24 \text{ IN}^4$$

$$T_G = \frac{68(3.0)}{14.24} = 14.36 \text{ K FOR (2) BOLTS}$$

$$= 7.16 \text{ K PER BOLT} < 12.12 \text{ K --- O.K. (SEE NEXT PAGE)}$$

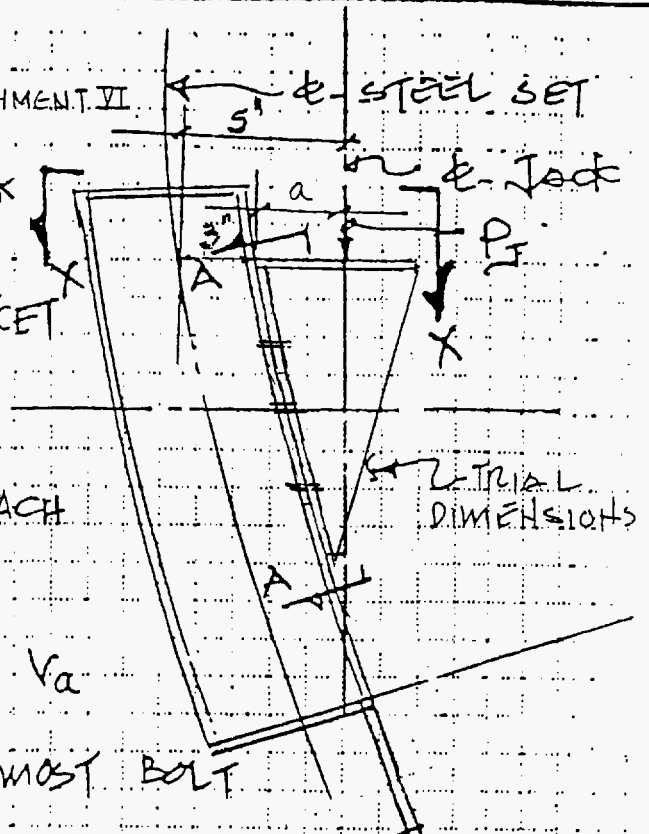
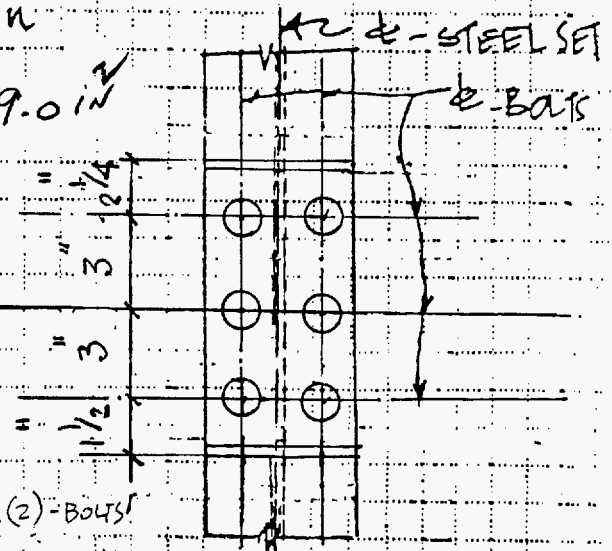


FIGURE-B



SECTION A-A

$$V_a = 7.9^k \text{ --- AISC 4-3}$$

$$T_a = 20^{ksi} \times 0.606 = 12.12^k \text{ --- AISC 4-3 \& 4-147}$$

$$f_v = \frac{5.67^k}{0.7854} = 7.22^{ksi}$$

$$26 - 1.8 f_v = 13.0^{ksi} < 20^{ksi} \text{ --- O.K. (AISC 5-74, TABLE J3.3)}$$

USE 6-1" ϕ ASTM A307 (60,000 PSI) MINIMUM WITH ASTM A563,

GRADE DH HEAVY HEX NUTS AND ASTM F436 WASHERS, TYPE I,
UNLESS SHOWN OTHERWISE. ALL BOLTS SHALL BE SNUG TIGHT.

2. DESIGN OF JACK PLATE:

REPRESENTATIVE PARAMETERS
SHOWN ON SECT. X-X

A_J = JACK CROSS SECTIONAL
AREA @ BASE

$$A_J = \frac{\pi (2.75)^2}{4} = 5.94 \text{ in}^2$$

P_p = PRESSURE FROM JACK ON
PLATE UNDER JACK
BASE

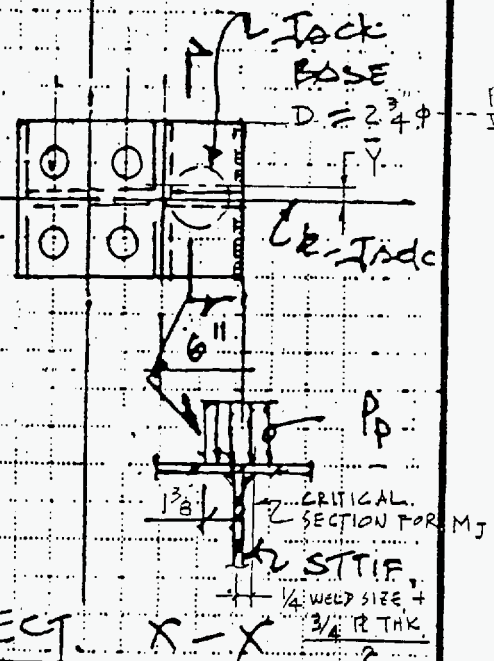
$$P_p = \frac{34}{A_J} = 5.72 \text{ ksi}$$

M_J = MOMENT IN TOP JACKING SECT. X-X
PLATE (6" STRIP) FROM FIG. B

$$= P_p \left(\frac{A_J}{2} \right) (\bar{y}) ; \quad \bar{y} = R - R \left(1 - \frac{4}{3\pi} \right) = 0.584 \text{ --- (AISC 6-20)}$$

$$M_J = 5.72 \times \left(\frac{5.94}{2} \right) \left(0.584 - 0.25 - \frac{0.75}{2} \right) \approx 0 \text{ "K / 6" STRIP}$$

(ALTERNATE DESIGN
BY CONTRACTOR'S
OPTION.)



DETERMINE THICKNESS OF CAP PLATE,

t = THICKNESS OF CAP PLATE.

$$S = \frac{bt^2}{6} = \frac{6t^2}{6} = t^2$$

$$S = \frac{MJ}{F_b}$$

$$t^2 = \frac{MJ}{F_b}$$

$$F_b = 0.75 F_u = 27 \text{ ksi} \quad \text{--- (AISC PAGE 5-48, F2-1)}$$

$$t^2 = \frac{0.0}{27} = 0$$

$$t = 0$$

USE $\frac{3}{4}$ " PL - HORIZONTAL PLATE FOR JACKING BRACKET.

DESIGN OF VERTICAL PLATE OF THE JACKING BRACKET(a) STIFFENER PLATE ~

WIDTH TO THICKNESS RATIO

$$d/t \leq 127/\sqrt{F_y} \quad \text{--- (AISC, P 5-36)}$$

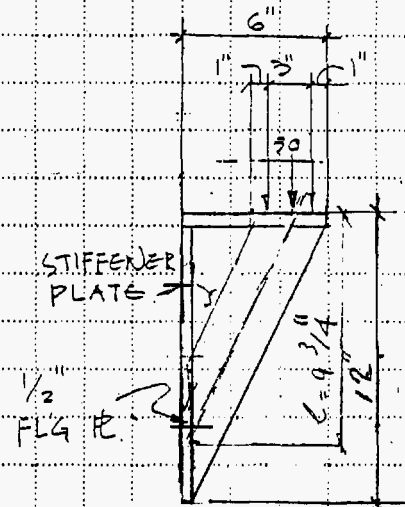
$$d = 6" \text{ MAX.}$$

$$t_{\text{MIN}} = \frac{d}{127/\sqrt{F_y}} = \frac{6}{21.17} = 0.283"$$

TRY $\frac{3}{4}"$ STIFFENER PLATE W/
 $\frac{1}{2}"$ FLANGE PLATE.

CHECK STIFFENER PLATE FOR JACK LOAD.

THE STIFFENER PLATE CAN BE IDEALIZED

AS A COMPRESSION ELEMENT $\frac{3}{4}" \times 4" \times 9\frac{3}{4}"$ LG.

$$I_{\text{STIFF. PL.}} = \frac{4 \times (0.75)^3}{12} = 0.14 \text{ IN}^4$$

$$A = 0.75 \times 4 = 3.0 \text{ IN}^2$$

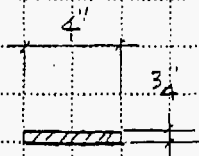
$$r = \sqrt{\frac{0.14}{3.0}} = 0.216$$

$$KL = \frac{3}{4} \times 9.75 = 7.31 \text{ --- EFFECTIVE LENGTH}$$

(AISC K1.8, PAGE 5-B.2)

$$KL/r = 7.31/0.216 = 33.85 \Rightarrow F_a = 19.6 \text{ ksi} \text{ --- AISC, TABLE C-36}$$

$$P_a = 19.6 \text{ ksi} \times 3.0 = 58.8 \text{ K} > 34 \text{ K} \text{ --- O.K.}$$

USE $\frac{3}{4}"$ STIFFENER PLATE AS SHOWN.

(b) WELDING OF STIFFENER PLATE TO FLAG PLATE OF JACKING BRACKET ~

TRY $\frac{1}{4}$ " FILLET WELD $\sqrt{\frac{1}{4}}$ 14" LG.

$$A_w = \text{WELD AREA} = (2 \times \frac{1}{4}) (12) = 6 \text{ in}^2$$

$$M = 34 \text{ k} \times 4" = 68 \text{ in-k}$$

$$P/A = 34/6 = 5.67 \text{ ksi}$$

$$S_w = \frac{bd^2}{6} = (2 \times \frac{1}{4}) \times \frac{12^2}{6} = 12.0 \text{ in}^2$$

$$\frac{M}{S_w} = 68/12 = 5.67 \text{ ksi}$$

RESULTANT STRESS IN WELD

$$= [(5.67)^2 + (5.67)^2]^{1/2} = 8.02 \text{ ksi}$$

ALLOWABLE WELD STRESS = BASE METAL --- (AISC PAGE 5-70)

$$= 21.6 \text{ ksi} > 8.02 \text{ ksi} \text{ --- O.K.}$$

MINIMUM SIZE OF FILLET WELD FOR BASE METAL PLATE

OF $\frac{1}{2}$ TO $\frac{3}{4}$ " IS $\frac{1}{4}$ " WELD --- O.K. (AISC TABLE J2.4)

USE $\sqrt{\frac{1}{4}}$ FILLET WELD E70XX MINIMUM ELECTRODES.

(C) FLG # OF JACKING BRACKET IN CONTACT WITH W6x20 FLG :

• TRY 1/2" PLATE, ASTM A36 MATERIAL,

∴ MIN. BOLT EDGE DISTANCE L

PARALLEL TO THE LINE OF

$$\text{FORCE} = 3' > 1\frac{1}{2}d = 1.5''$$

AND BOLT SPACING

$$= 3' \wedge 3d = 3'$$

ALLOWABLE BEARING

$$F_p = 1.2 F_u \quad \dots \text{AISC p 4-C}$$

$$= 1.2 \times 58 \text{ ksi} = 69.6 \text{ ksi}$$

BEARING AREA

$$= 1" \times \frac{1}{2}" = 0.5" \text{ IN}^2$$

SHEAR ON EACH BOLT

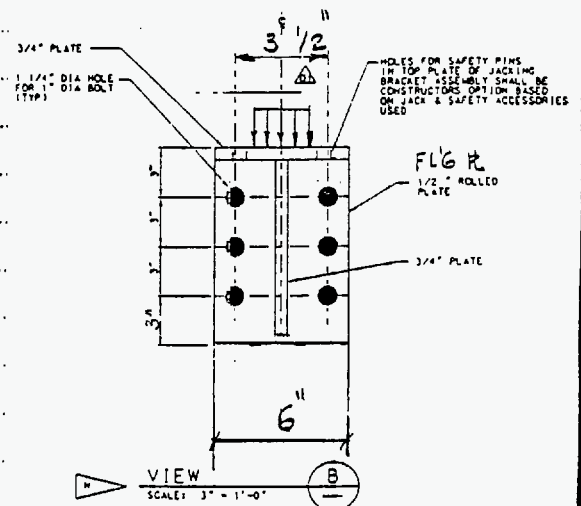
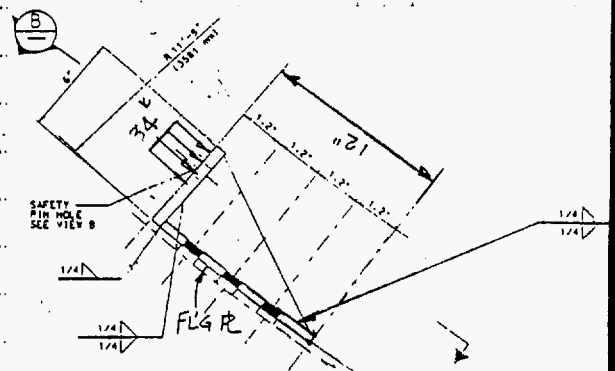
$$= \frac{34.1^{\text{k}}}{6} = 5.67^{\text{k}}$$

BEARING STRESS

$$= \frac{5.67}{0.5} = 11.34 \text{ ksi} < F_p = 69.6 \text{ ksi}$$

USE 1/2" FLG PLATE

ASTM A36 MATERIAL



PURPOSE III.D

TIE ROD AND PIPE
SPACER CALCULATIONDESIGN TIE ROD

P_1 = CONSTRUCTION/ERECTION
DEAD LOAD OF WBSL
STEEL SET SEGMENT
THAT COULD INDUCE

MAXIMUM TENSION

TO TIE ROD. (3-TIE RODS PER SETS FOR CALCS ONLY)

$$P_1 = 19(3)(1.25) \text{ INCREASED FOR ATTACHMENTS}$$

$$= 736.25 \text{ lb}$$

$$T = \text{ROD TENSION} = P_1 / \sin \alpha$$

$$T = \frac{736.25 \text{ lb}}{\sin 10.62^\circ} = 3,995 \text{ lb}$$

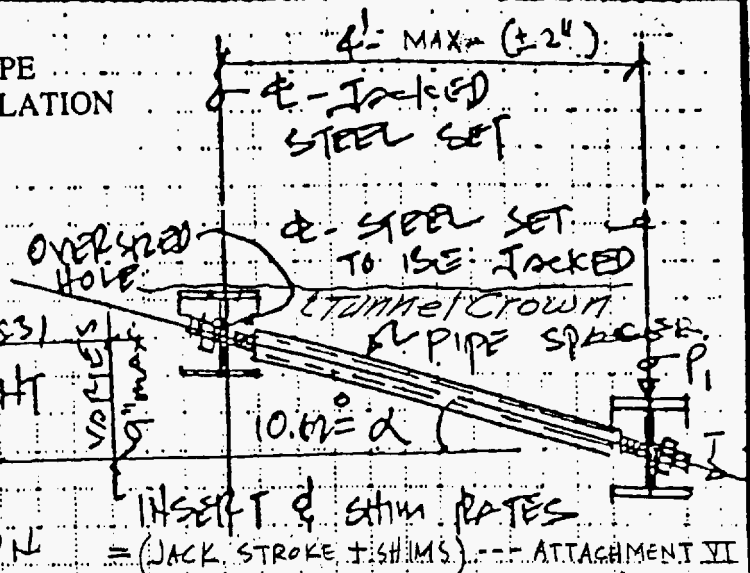
USE 3/4" DIA TIE ROD A-307 MINIMUM

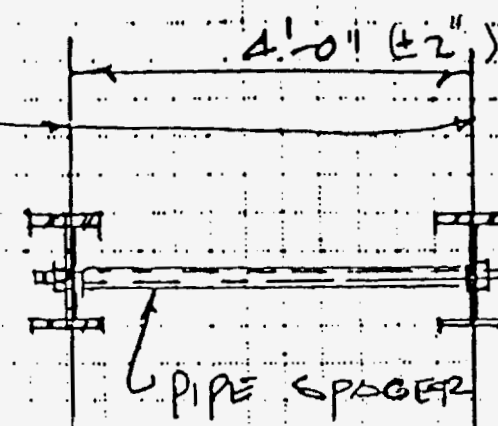
T_A = ALLOWABLE TENSION FOR 3/4" A-307

$$T_A = 8.8 K \rightarrow (AISC 4-3) \text{ OR } 20(0.334) = 6.68 K \text{ (AISC 4-14T)}$$

$$T < T_A = 6.68 K$$

USE MAXIMUM 15/16" OVERSIZED HOLES IN WB ^{OR W6} WEB
FOR TIE ROD 3/4" TO AVOID THE BENDING OF RODS.



DESIGN PIPE SPACER


I-STEEL SET

MAXIMUM AXIAL LOAD

TO PIPE SPACER EQUAL

TO BOLT TENSION CAPACITY = 6.68K

$$P_a = 6.68K$$

$$L = 4'-4"$$

TRY $1\frac{1}{2}" \phi$ PIPE SCHEDULE 40

$$A = 0.799 \text{ in}^2$$

$$r = 0.623$$

AISC P1-93

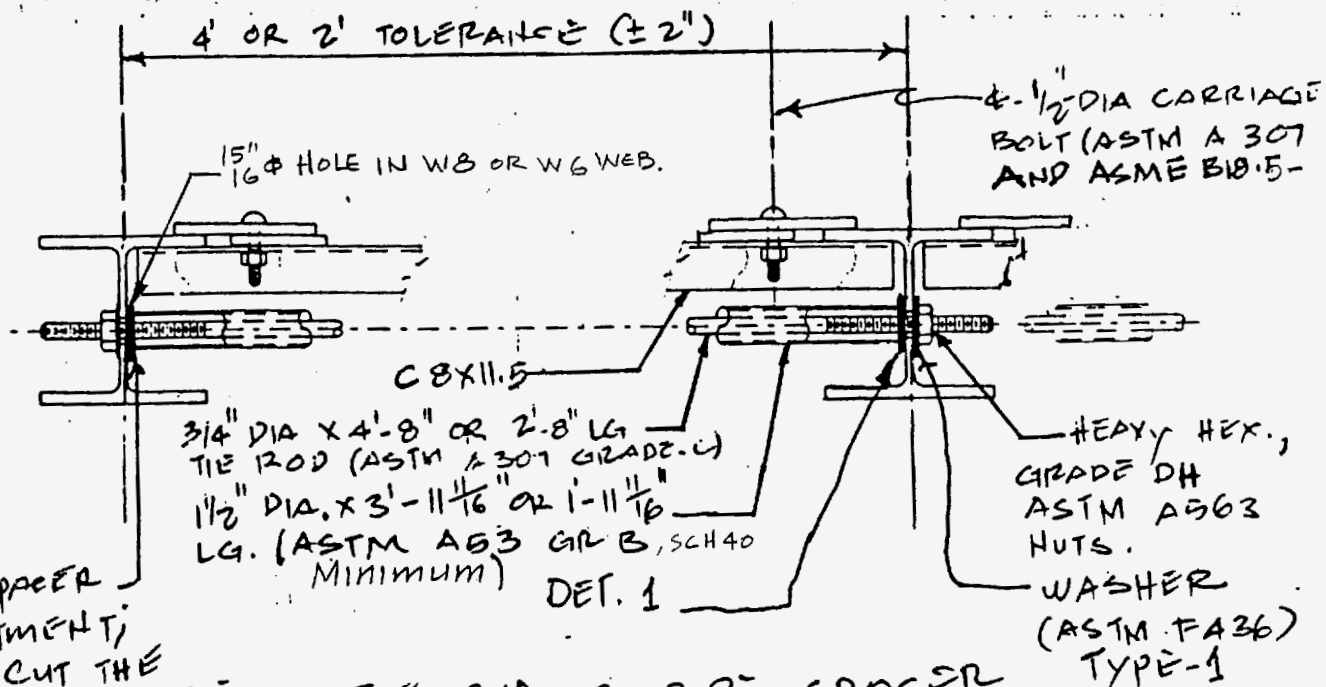
$$\frac{KL}{r} = \frac{(1.433)(12)}{0.623} = 83.4$$

$$\therefore F_a = 14.97 \text{ ksi} \quad \text{----- AISC P3-16, TABLE C-36}$$

$$P_c = \text{CAPACITY FOR } 1\frac{1}{2}" \phi \text{ PIPE}$$

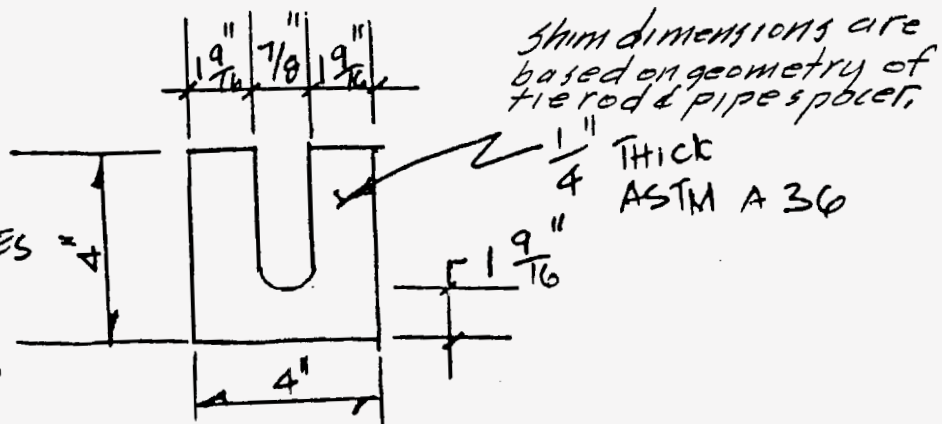
$$= 0.799 (14.97) = 11.96K > P_a = 6.68K$$

USE $1\frac{1}{2}" \phi$ SCH 40 PIPE - ASTM-A53 GR B, MIN.

SUMMARY III.DTIE ROD & PIPE SPACER

PIPE SPACER
ADJUSTMENT;
FIELD CUT THE
PIPE TO MATCH THE
ACTUAL STEEL SET
SPACING FOR (-)
TOLERANCE
AND INSTALL SHIM
PLATES FOR (+)
TOLERANCE AS PER DET. 1.

USE UP TO
8- $\frac{1}{4}"$ SHIM PLATES
AS REQUIRED FOR
EACH PIPE
SPACER (FOR "+"
TOLERANCE CASES)

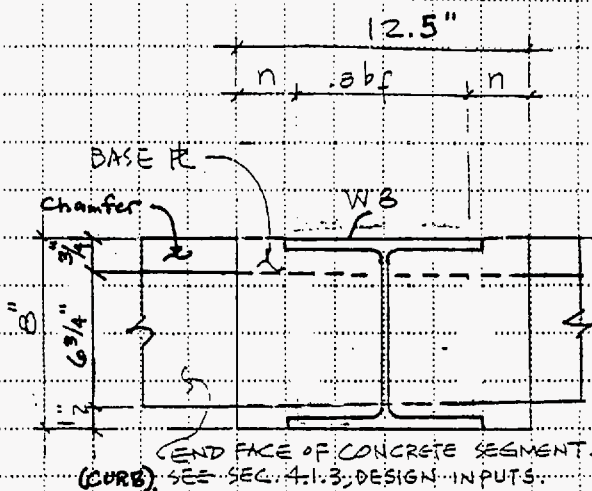
DET. 1 (PIPE SPACER SHIM PLATES)

(NOT USED) Replaced by page III-65.
Previous analysis on pages III-63
& III-64 developed rectangular
dimensions of the foot plate
based on element axial loads
($P_a = 113.6^k$ at Node 41). Subsequent
analysis use the average axial
load of 121.8 from File plot2dy.sav
(see page III-108) to design the
foot plate.

(NOT USED) Replaced by page III-65.

Purpose III.E Steel Set Foot Plate CalculationDesign of Foot Plate

(a) W8x31



For the W8x31, max $P_{\text{allow}} >$
 max P_a @ foot PL (See pages
 III-108 & III-78) \Rightarrow Design
 using $P_a = 121.8 \text{ k}$ (D+R+U+Seismic)
 Static Axial Ave = 79.36 k (Page III-
 108) is 65% of P_a . P_a will control.
 $A_b = \text{Bearing Area} = 12.5" \times 6.75"$
 $= 84.38 \text{ in}^2$

$$f_p \equiv \text{Actual bearing pressure} \\ = \frac{P_a}{A_b} = \frac{121.8 (1000)}{84.38} = 1443.6 \text{ psi}$$

$F_p \equiv \text{Allowable bearing pressure} = 0.35 f_c' \text{ (AISC 3-107)}$

$f_c' = 5000 \text{ psi}$ (Ref. 5.21) $\Rightarrow F_p = 0.35 (5000) = 1750 \text{ psi}$

$f_p < F_p \Rightarrow \text{OK for bearing}$

Thickness of plate = $3/4"$ to match existing design

The base plate is not fully supported by the invert curb and cannot be analyzed by the conventional AISC methods (AISC 3-106).

Therefore, a finite element analysis was performed (see Attachment X) to check the actual stresses developed in the plate.

As shown in Attachment X, the actual stresses developed are within the 36 ksi allowable stress:

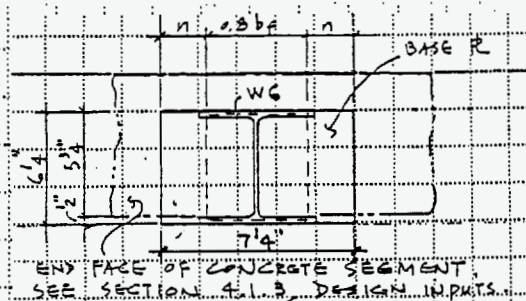
$$F_b = 0.75 F_y = 0.75 (36) = 27 \text{ ksi (AISC 5-48)}$$

$$\text{Seismic increase} = 1.333 F_b = 1.333 \times 27 = 36 \text{ ksi}$$

\Rightarrow Use 12.5" x 8" x $3/4"$ PL, ASTM A 36

Purpose III.E (con't)

(b) W6x20



For the W6x20, max P_{ave}
 $< \max P_a @ \text{foot R}$ (See pages
 III-109 & III-79) \Rightarrow Design
 using $\max @ \text{foot R}$:
 $P_a = 41.96 \text{ k}$ (D+R+U+Seismic)
 $A_b = 7.25 \times 5.75 = 41.69 \text{ in}^2$
 (Dimensions match connection R
 design, pages III-102 & III-15)
 $< F_p = 1750 \text{ psi} \Rightarrow \text{OK}$

$$f_p = \frac{P_a}{A_b} = \frac{41.96 (1000)}{41.69} = 1006 \text{ psi}$$

Check bending (AISC 3-106):

$$m \approx 0; n = (7.25 - 0.8 \times 6) / 2 = 1.225"$$

$$t_p = 2n \sqrt{\frac{f_p}{F_y}} = 2(1.225) \sqrt{\frac{1006}{36}} = 0.41" \Rightarrow \text{Use } 5/8" \text{ to match existing design}$$

Since $1/3$ allowable seismic increase not used, no need to check static case. \Rightarrow Use $5/8" \times 6 1/4" \times 7 1/4"$ PL, ASTM A36DETERMINE WELD $\sqrt{4}$ LENGTH REQ'D AT STEEL SET WEB:

$$\text{MAXIMUM SHEAR} = P_v = 7.8 \text{ k} \text{ --- w/seismic}$$

TRY $3" \sqrt{4}$ OF WELD ON STEEL SET WEB.

$$\begin{aligned} \text{ALLOWABLE SHEAR} &= (0.3 \times 70) \times (0.25 \cos 45) \times (2 \times 3) \times 1.33 \\ &= 29.6 \text{ k} > P_v = 7.8 \text{ k} \text{ --- O.K.} \end{aligned}$$

BY INSPECTION, WELD IS ADEQUATE FOR $P_v = 6.81 \text{ k}$ w/o seismic $1/4"$ IS THE MINIMUM WELD SIZE ALLOWED

AISC 5-67 TABLE J2.4

TRY $4"$ OF $1/4"$ FILLET WELD ON ONE SIDE

$$(13 \times 70) (0.25 \cos 45) (4) \times 1.33 = 19.74 \text{ k}$$

MINIMUM WELD SIZE GOVERNS

7.8 k (OK)

PURPOSE III.E - ALTERNATE I, (SEE ATTACHMENT IX)

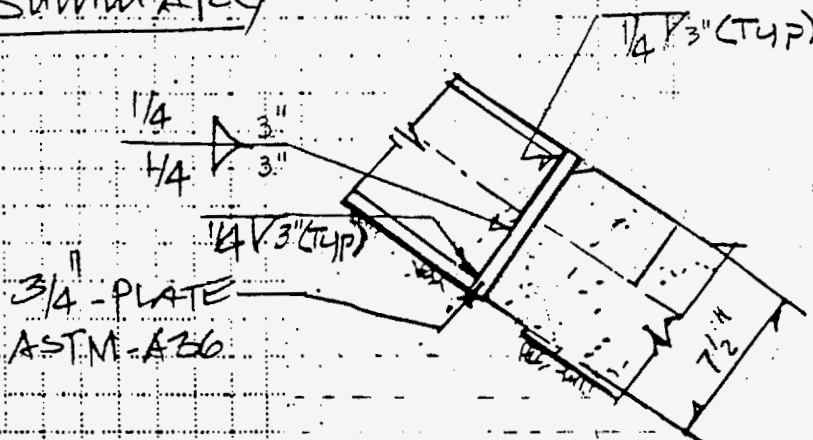
SINCE PRIMARY FORCES INDUCED TO FOOT PLATE ARE COMPRESSIVE, THE WELD REQUIREMENT IS MINIMUM.

FOR WELD RATE TO WB USE FILLET

WELDS E70XX (minimum) ELECTRODES

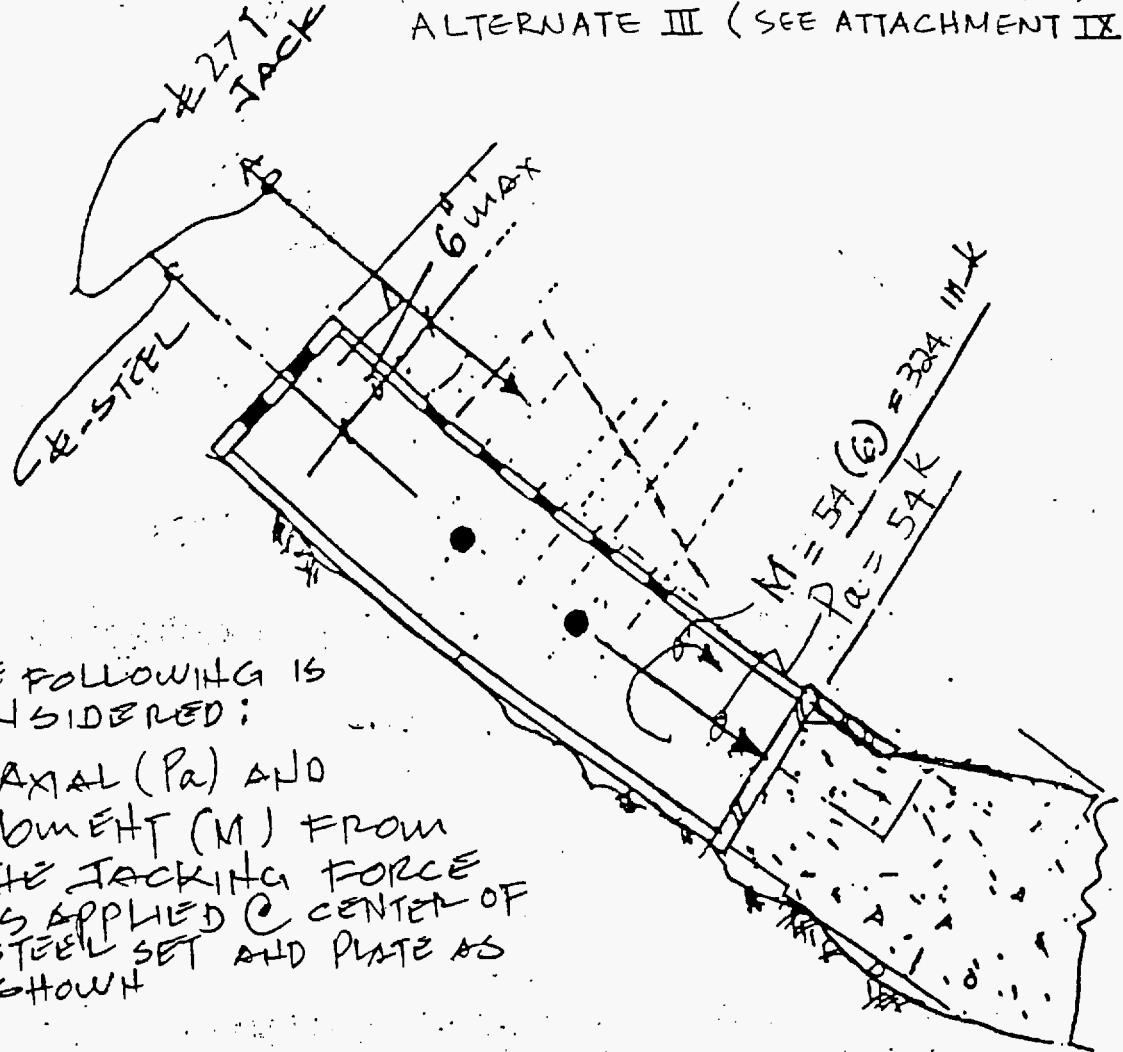
USE $\frac{1}{4}$ " WELD AS MIN. AISC

TABLE J2.4.

SUMMARY

STEEL SET FOOT PLATE
(ALTERNATE I)

PURPOSE III.E —

STEEL SET FOOT PLATE DESIGN;
ALTERNATE III (SEE ATTACHMENT IX)THE FOLLOWING IS
CONSIDERED:

AXIAL (P_a) AND
MOMENT (M) FROM
THE JACKING FORCE
IS APPLIED @ CENTER OF
STEEL SET AND PLATE AS
SHOWN

 P_a = AXIAL LOAD FROM JACKING FORCE

$$= 54 \text{ K}$$

 M = MOMENT FROM JACKING FORCE WITH
ECCENTRICITY OF 6'

$$= 324 \text{ IN-K}$$

$$F_p = 0.35(f_c) = 0.35(5000) = 1750 \text{ PSI} \quad \text{--- AKC P 5-79}$$

F_p = ALLOWABLE BEARING CAPACITY FOR $f'_c = 5000$ PSI CONCRETE.

$$f_p = \frac{P_u}{A} \pm \frac{M_u c}{I}$$

→ BASIC EQUATION

A = FOOT PLATE AREA IN CONTACT WITH CONCRETE SURFACE.

I = MOMENT OF INERTIA FOR FOOT PLATE / RESPECT TO ϕ -STEEL SET.

TRIAL DIMENSION BASE

TRY 8" x 12.5" PLATE

$$A = 6\frac{3}{4} \times 12.5 = 84.38 \text{ in}^2$$

$$c = 4 \text{ in}$$

$$I = \frac{12.5(8)^3}{12} = 533.33 \text{ in}^4$$

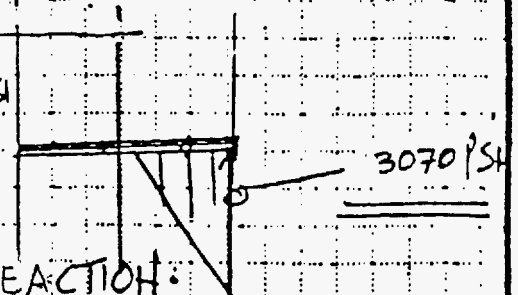
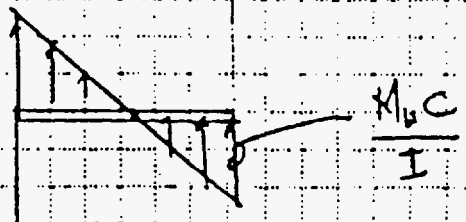
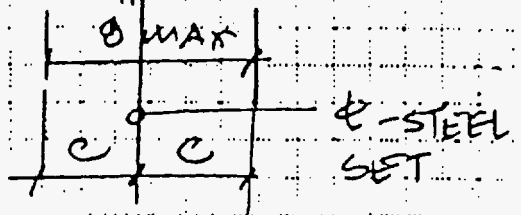
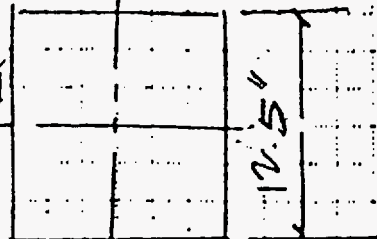
$$f_p = \frac{54}{84.38} \pm \frac{324 \times (4)}{533.33}$$

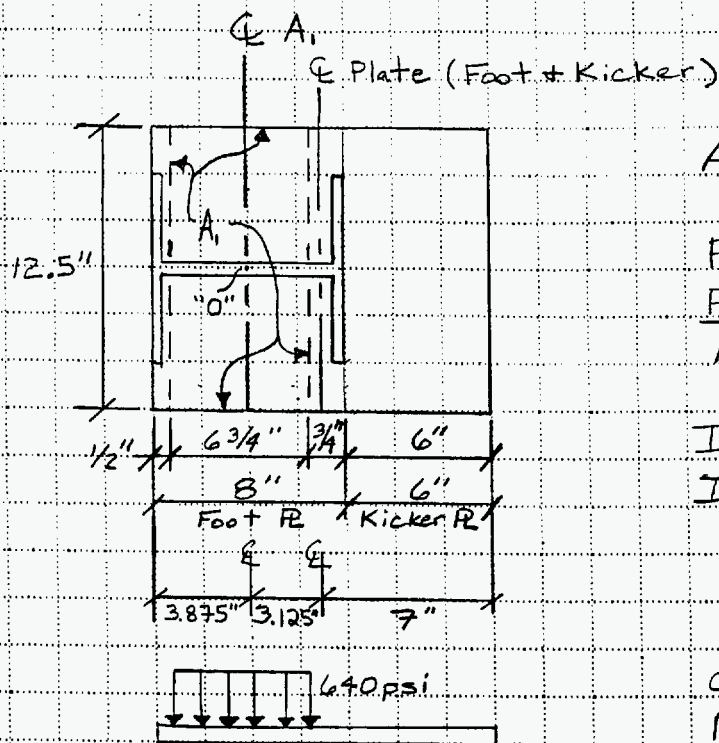
$$= 0.64 \pm 2.43$$

$$= 3.07 \text{ ksi} = 3070 \text{ psi} > F_p = 1750 \text{ psi}$$

N.G.

REVISE TRIAL DIMENSION TO INCLUDE VERTICAL PLATE REACTION.





$$A_1 = \text{Bearing Area} \\ = (6 \frac{3}{4}) (12.5) = 84.38 \text{ in}^2$$

$$P_a = 54 \text{ k}$$

$$\frac{P_a}{A_1} = \frac{54}{84.38} = 0.64 \text{ ksi}$$

$$I \text{ (about C.G. of } A_1 \text{ @ "O")}$$

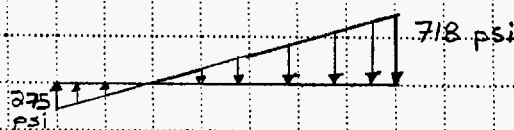
$$I = \frac{12.5(14)^3}{12} + (12.5)(14)(3.125)^2$$

$$= 2858.33 + 1708.98$$

$$= 4567.31 \text{ in}^4$$

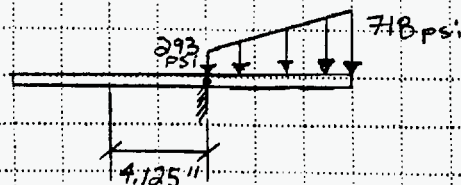
$$C_1 = 3.875" \quad C_2 = 10.125"$$

$$M = 324 \text{ in-k}$$



$$\frac{M C_1}{I} = \frac{324(3.875)}{4567.31} = 0.275 \text{ psi}$$

$$\frac{M C_2}{I} = \frac{324(10.125)}{4567.31} = 0.718 \text{ psi}$$



Trap. loading for design of
kicker R: from similar Δ s,

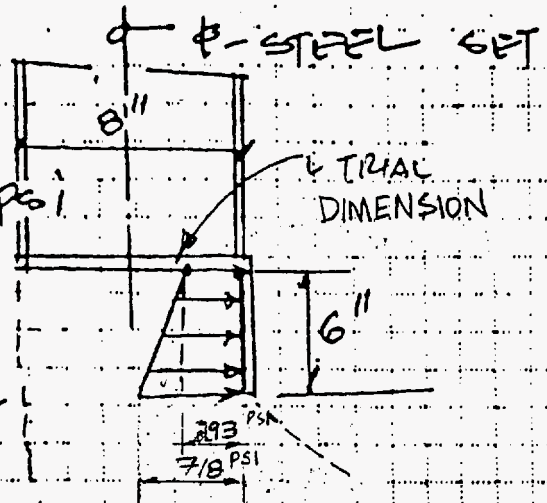
$$\frac{718}{10.125} = \frac{x}{4.125} \Rightarrow x = 293 \text{ psi}$$

MAXIMUM PRESSURE ON
CONCRETE EQUAL TO

$$\underline{718 \text{ PSI}} \text{ MAXIMUM } < F_p = 1750 \text{ PSI}$$

DESIGN VERTICAL RATE

$M_{max} = \text{MOMENT @ TOP OF PLATE}$



PRESSURE DIAG ON
VERTICAL RATE

$$= 293(6)(3) + \frac{(718-293)(6)(4)}{2}$$

$$= 5274 + 5100$$

$$= 10374 \text{ IN-LB}$$

$F_b = 27 \text{ KSI}$ ALLOWABLE FOR RATE (AISC 5-48, F2-1)

$$S_x = \frac{bt^3}{6} = \frac{12.5t^3}{6} = 2.08\bar{3}t^3$$

$$F_b = \frac{M}{S_x} \Rightarrow S_x = \frac{M}{F_b} \Rightarrow 2.08\bar{3}t^3 = \frac{10374}{27000} = 0.384$$

$$\Rightarrow t = \underline{0.429"} \text{ }$$

\Rightarrow Use $\frac{1}{2}"$ plate to match existing design

No stiffener plates are required; however, to match existing drawings, the $2\frac{1}{2}"$ stiffeners shown are OK.

Check weld size:

Check $\frac{1}{4}$ weld:

$$\begin{aligned}\text{Max Shear on Weld} &= \frac{293 + 718}{2} (6)(12.5) / 1000 \\ &= 37.91 \text{ k}\end{aligned}$$

$$\begin{aligned}\text{Weld Effective area} &= (\frac{1}{4} \times 0.707)(2)(12.5) \\ &= 4.42 \text{ in}^2\end{aligned}$$

$$\begin{aligned}\text{Weld Capacity} &= (0.3)(70)(4.42) \quad [\text{AISC 5-70}] \\ &= 92.8 \text{ k} > 37.9 \text{ k} \Rightarrow \underline{\underline{\text{OK}}}\end{aligned}$$

(NOT USED) stiffeners not required.

(NOT USED) Stiffeners not required.

(NOT USED) Stiffeners not required.

PURPOSE III.E - ALTERNATE III (SEE ATTACHMENT IX-16)

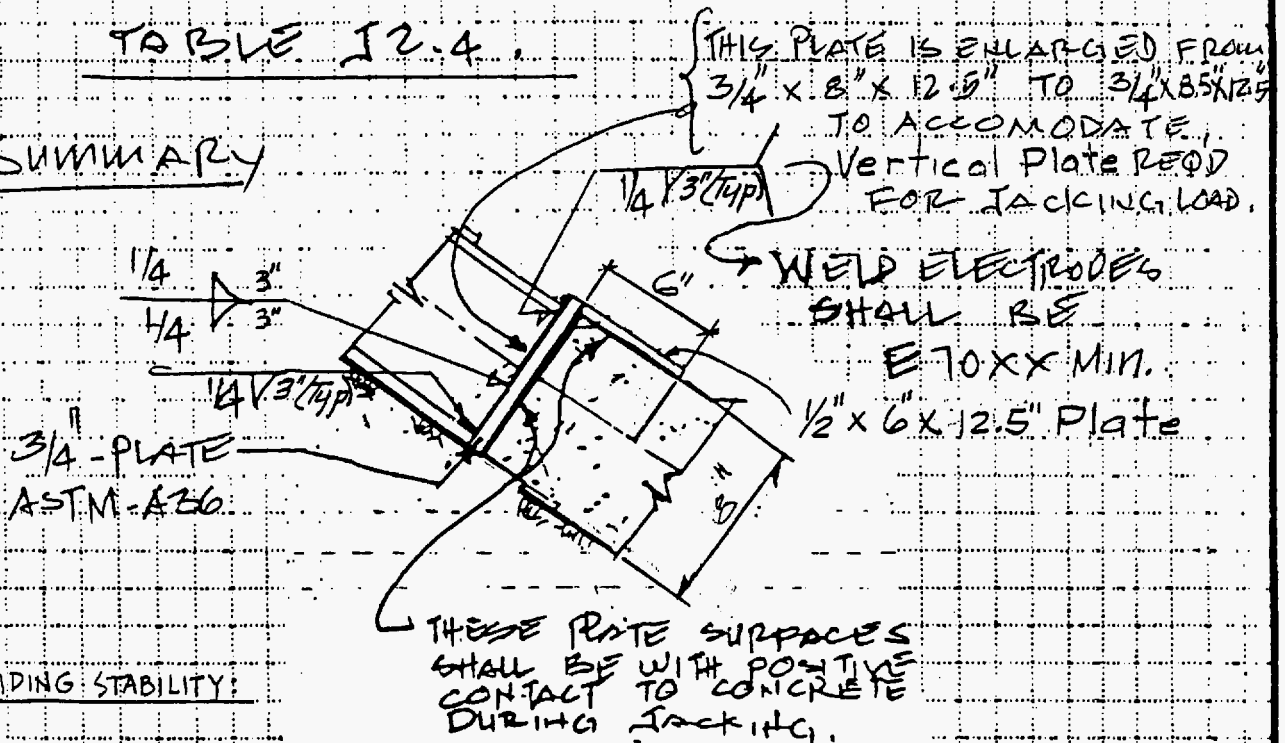
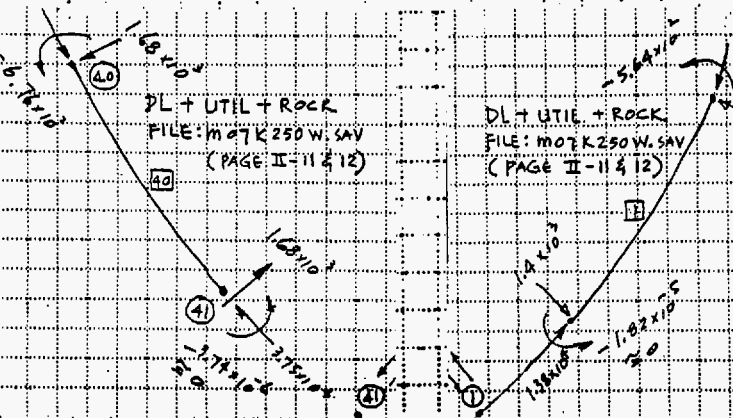
SINCE PRIMARY FORCES INDUCED TO FOOT PLATE ARE COMPRESSIVE, THE WELD REQUIREMENT IS MINIMUM.

FOR WELD RATE TO W8 USE FILET

WELDS E70XX MINIMUM ELECTRODES

USE 1/4" WELD AS MIN. AISC

TABLE J2.4.

SUMMARYSLIDING STABILITY:

REFERING TO PAGE III-113, THE CRITICAL SLIDING RESISTANCE AT SUPPORT/FOOT PLATE IS AT RUN NO. 11. ON PAGE III-113, THE SLIDING RESISTANCE WAS CALCULATED CONSERVATIVELY BY AVERAGING FORCES IN ELEMENT 40 AND 41. ACTUAL CRITICAL FORCES CAN BE FOUND AT NODE 41 (THE FOOT PLATE) AND ARE REPRODUCED ON THE LEFT. SLIDING STABILITY RATIO = $\frac{0.3(1.38 \times 10^9)}{1.4 \times 10^3} = 2.96 > 1.0$ OK.

Purpose III E (Cont.)

TABLE 1A. SEISMIC COMPUTER RUN IDENTIFIERS (ATTACHMENT II)

RUN	FILENAME	ROCK TYPE	STATION	MEMBER	SPACING	LOADING ¹
1	p10k2dy.sav	PTn	10+00	W8x31	2 ft	D+U+R+E
2	p07k2dy.sav	TCW	07+00	W8x31	4 ft	D+U+R+E
3	p18k2dy.sav	TSW ₁	18+00	W8x31	4 ft	D+U+R+E
4	p34k2dyx.sav	TSW ₂	34+00	W8x31	2 ft	D+U+R+E
5	m07_k2dy.sav	TCW	07+00	W6x20	4 ft	D+U+R+E
6	m18_k2dy.sav	TSW ₁	18+00	W6x20	4 ft	D+U+R+E
7	m27_k2dy.sav	TSW	27+00	W6x20	4 ft	D+U+R+E
8	m34_k2dy.sav	TSW ₂	34+00	W6x20	4 ft	D+U+R+E
9	m53_k2dy.sav	TSW ₂	53+00	W6x20	4 ft	D+U+R+E

¹ Dead Load (D) + Utility Loads (U) + Rock Load (R) + Seismic Load (E)

TABLE 1B. STATIC COMPUTER RUN IDENTIFIERS (ATTACHMENT II)

RUN	FILENAME	ROCK TYPE	STATION	MEMBER	SPACING	LOADING ²
10	m10k250w.sav	PTn	10+00	W8x31	2 ft	D+U +R
11	m07k250w.sav	TCW	07+00	W8x31	4 ft	D+U +R
12	m18k250w.sav	TSW ₁	18+00	W8x31	4 ft	D+U +R
13	m34k250x.sav	TSW ₂	34+00	W8x31	2 ft	D+U +R
14	m07_k2.sav	TCW	07+00	W6x20	4 ft	D+U +R
15	m18_k2.sav	TSW ₁	18+00	W6x20	4 ft	D+U +R
16	m27_k2.sav	TSW ₂	27+00	W6x20	4 ft	D+U +R
17	m34_k2.sav	TSW ₂	34+00	W6x20	4 ft	D+U +R
18	m53_k2.sav	TSW ₂	53+00	W6x20	4 ft	D+U +R

² Dead Load (D) + Utility Loads (U) + Rock Load (R) (No seismic)

Purpose: III
(Cont.)

TABLE 2A. SUMMARY OF REACTIONS AT BASE OF STEEL SETS¹ (SEISMIC LOAD CASE -W8x31)

RUN	ELEM.	NODE ⁵		FORCES (SI UNITS) ²		CONVER. FACTOR ³	FORCES (ENGLISH UNITS) ⁴	
		Nod1	Nod2	F-Shear	F-Axial		F-Shear	F-Axial
1	48	48	01	+2.946E+04	+5.693E+05	1.3704E-04	4.04	78.02
	01	01	02	-1.025E+04	+7.314E+05	"	-1.40	100.23
	40	40	41	+1.350E+04	+8.288E+05	"	1.85	113.58
	41	41	42	-2.737E+04	+6.597E+05	"	-3.75	90.41
2	48	48	01	+6.615E+03	+4.946E+04	2.7409E-04	1.81	13.56
	01	01	02	+1.695E+03	+9.691E+04	"	0.46	26.56
	40	40	41	-1.342E+03	+1.048E+05	"	-0.37	28.72
	41	41	42	+6.926E+03	+7.383E+04	"	1.89	20.24
3	48	48	01	+1.809E+04	+2.272E+05	2.7409E-04	4.96	62.27
	01	01	02	+5.482E+03	+2.344E+05	"	1.50	64.25
	40	40	41	-5.996E+03	+2.688E+05	"	-1.64	73.68
	41	41	42	-1.776E+04	+3.082E+05	"	-4.87	84.47
4	48	48	01	+4.106E+04	+2.219E+05	1.3704E-04	5.63	30.41
	01	01	02	+5.026E+03	+3.794E+05	"	0.69	52.00
	40	40	41	-3.537E+03	+4.062E+05	"	-0.48	55.67
	41	41	42	-2.736E+04	+2.459E+05	"	-3.75	33.70

FOOTNOTES:

- From Computer Runs 1 thru 4 identified in Table 1A (Attachment II)
- SI Units = Newtons
- Conversion Factor = F(newtons) x Spacing(ft)/3.28084(ft/m) x 0.22481(lbf/newton) x 0.001(kip/lbf) = F(kip)
- English Units = Kips
- Pinned Nodes (Moment = 0) are at Nodes 01 & 41

Response III
(Cont.)

TABLE 2B. SUMMARY OF REACTIONS AT BASE OF STEEL SETS¹ (SEISMIC LOAD CASE -W6x20)

RUN	ELEM	NODE ⁵		FORCES (SI UNITS) ²		CONVER. FACTOR ³	FORCES (ENGLISH UNITS) ⁴	
		Nod1	Nod2	F-Shear	F-Axial		F-Shear	F-Axial
5	48	48	01	+9.245E+03	+2.151E+04	2.7409E-04	2.53	5.90
	01	01	02	-1.525E+02	+3.071E+04	"	-0.04	8.42
	40	40	41	+1.162E+02	+3.195E+04	"	0.03	8.76
	41	41	42	-4.998E+03	+2.083E+04	"	-1.37	5.71
6	48	48	01	+2.114E+04	+1.051E+05	2.7409E-04	5.79	28.81
	01	01	02	+2.872E+02	+5.643E+04	"	0.08	15.47
	40	40	41	-2.530E+02	+7.635E+04	"	-0.07	20.93
	41	41	42	-2.202E+04	+1.531E+05	"	6.04	41.96
7	48	48	01	+2.517E+04	+1.300E+04	2.7409E-04	6.90	3.56
	01	01	02	+8.836E+02	+7.251E+04	"	0.24	19.87
	40	40	41	-1.020E+03	+8.315E+04	"	-0.28	22.79
	41	41	42	-2.845E+04	+3.529E+04	"	-7.80	9.67
8	48	48	01	+1.236E+04	+9.559E+03	2.7409E-04	3.39	2.62
	01	01	02	+9.089E+02	+7.749E+04	"	0.25	21.24
	40	40	41	-7.561E+02	+8.131E+04	"	-0.21	22.29
	41	41	42	-6.258E+03	+7.554E+04	"	-1.72	20.70
9	48	48	01	+2.456E+04	+1.328E+04	2.7409E-04	6.73	3.64
	01	01	02	+9.359E+02	+7.082E+04	"	0.26	19.41
	40	40	41	-5.696E+02	+7.827E+04	"	-0.16	21.45
	41	41	42	-2.250E+04	+4.287E+04	"	-6.17	11.75

FOOTNOTES:

1. From Computer Runs 5 thru 9 identified in Table 1A (Attachment II)
2. SI Units = Newtons
3. Conversion Factor = F(newtons) x Spacing(ft)/3.28084(ft/m) x 0.22481(lbf/newton) x 0.001(kip/lbf) = F(kip)
4. English Units = Kips
5. Pinned Nodes (Moment = 0) are at Nodes 01 & 41

Propose III
(Cont.)

TABLE 2C. SUMMARY OF REACTIONS AT BASE OF STEEL SETS¹ (STATIC LOAD CASE - W8x31)

RUN	ELEM.	NODE ⁵		FORCES (SI UNITS) ²		CONVER. FACTOR ³	FORCES (ENGLISH UNITS) ⁴	
		Nod1	Nod2	F-Shear	F-Axial		F-Shear	F-Axial
10	48	48	01	+1.805E+04	+3.410E+05	1.3704E-04	2.47	46.73
	01	01	02	-7.099E+03	+4.667E+05	"	-0.97	63.96
	40	40	41	+1.246E+04	+4.875E+05	"	1.71	66.81
	41	41	42	-1.513E+04	+3.543E+05	"	-2.07	48.55
11	48	48	01	-1.207E+03	-5.178E+04	2.7409E-04	-0.33	-14.19 ⁶
	01	01	02	-1.403E+03	+1.379E+04	"	-0.38	3.78
	40	40	41	-1.682E+03	+3.749E+04	"	-0.46	10.28
	41	41	42	-1.576E+04	-2.465E+04	"	-4.32	-6.76 ⁶
12	48	48	01	+1.655E+04	+1.207E+05	2.7409E-04	4.54	33.08
	01	01	02	+2.345E+03	+1.462E+05	"	0.64	40.07
	40	40	41	-1.143E+03	+1.442E+05	"	-0.31	39.52
	41	41	42	-1.358E+04	+1.309E+05	"	-3.72	35.87
13	48	48	01	+3.282E+04	+1.111E+05	1.3704E-04	4.50	15.23
	01	01	02	+2.449E+03	+2.539E+05	"	0.34	34.80
	40	40	41	-2.068E+03	+2.647E+05	"	-0.28	36.28
	41	41	42	-1.538E+04	+1.082E+05	"	-2.11	14.82

FOOOTNOTES:

- From Computer Runs 10 thru 13 identified in Table 1B (Attachment II)
- SI Units = Newtons
- Conversion Factor = $F(\text{newtons}) \times \text{Spacing}(\text{ft}) / 3.28084(\text{ft/m}) \times 0.22481(\text{lbf/newton}) \times 0.001(\text{kip/lbf}) = F(\text{kip})$
- English Units = Kips
- Pinned Nodes (Moment = 0) are at Nodes 01 & 41
- Negative axial forces (tension) for Run No. 11 indicate that the rock is moving away from the steel set/invert & are a result of modelling assumptions in FLAC runs to provide conservative rock loads. In reality, the steel set remains in compression at all times.

PURPOSE III.E (Cont.)

TABLE 2D. SUMMARY OF REACTIONS AT BASE OF STEEL SETS¹ (STATIC LOAD CASE - W6x20)

RUN	ELEM.	NODE ⁵		FORCES (SI UNITS) ²		CONVER. FACTOR ³	FORCES (ENGLISH UNITS) ⁴	
		Nod1	Nod2	F-Shear	F-Axial		F-Shear	F-Axial
14	48	48	01	+4.352E+03	-1.685E+04	2.7409E-04	1.19	-4.62 ⁶
	01	01	02	-2.331E+02	+1.043E+04	"	-0.06	2.86
	40	40	41	+2.307E+02	+9.822E+03	"	0.06	2.69
	41	41	42	-7.839E+02	-1.633E+04	"	-0.21	-4.48 ⁶
15	48	48	01	+1.645E+04	+4.356E+04	2.7409E-04	4.51	11.94
	01	01	02	+5.369E+01	+3.370E+04	"	-0.01	9.24
	40	40	41	+1.172E+02	+3.892E+04	"	-0.03	10.66
	41	41	42	-1.879E+04	+4.925E+04	"	-5.15	13.50
16	48	48	01	+2.040E+04	-2.092E+04	2.7409E-04	5.59	-5.73 ⁶
	01	01	02	+8.914E+02	+5.366E+04	"	0.24	14.71
	40	40	41	-8.040E+02	+5.721E+04	"	-0.22	15.68
	41	41	42	-2.483E+04	-2.027E+04	"	-6.81	-5.56 ⁶
17	48	48	01	+8.100E+03	-2.764E+04	2.7409E-04	2.22	-7.58 ⁶
	01	01	02	+8.765E+02	+5.838E+04	"	0.24	16.00
	40	40	41	-5.700E+02	+5.361E+04	"	-0.16	14.69
	41	41	42	-1.458E+03	+2.165E+04	"	-0.40	5.93
18	48	48	01	+2.058E+04	-2.727E+04	2.7409E-04	5.64	-7.47 ⁶
	01	01	02	+8.523E+02	+5.076E+04	"	0.23	13.91
	40	40	41	-4.445E+02	+5.212E+04	"	-0.12	14.29
	41	41	42	-1.820E+04	-1.464E+04	"	-4.99	-4.01

FOOTNOTES:

1. From Computer Runs 14 thru 18 identified in Table 1B (Attachment II)
2. SI Units = Newtons
3. Conversion Factor = F(newtons) x Spacing(ft)/3.28084(ft/m) x 0.22481(lbf/newton) x 0.001(kip/lbf) = F(kip)
4. English Units = Kips
5. Pinned Nodes (Moment = 0) are at Nodes 01 & 41
6. Negative axial forces (tension) for Runs No. 14 & 16-18 indicate that the rock is moving away from the steel set/invert & are a result of modelling assumptions in the FLAC runs to provide conservative rock loads. In reality, the steel set remains in compression at all times.

Title: ESF Ground Support - Structural Steel Analysis

STEEL SET FOOT PLATE OFFSET FROM FACE OF INVERT CURB.

MAX. OFFSET REQUIRED FOR BEARING (SEE SKETCH BELOW)

$$P_u = P_e = 121.8^k \text{ (PAGE III-108)} \quad \left\{ \begin{array}{l} \text{USE UNFACTORED LOAD SINCE SEISMIC} \\ \text{LOAD BASED ON DYNAMIC ANALYSIS \&} \\ \text{CONSERVATIVE "DB" ZPA OF 0.37g H\&V} \\ \text{WHICH IS > USG SEISMIC 187 APPROX 2X} \end{array} \right.$$

$$P_u \leq \phi P_n = \text{BEARING STRENGTH} \leq \phi (.85) f_c' A_1 \quad \text{ACI 318, SEC. 10.15}$$

$$\phi = 0.70 \quad \text{ACI 318, SEC. 9.3.2.4}$$

$$f_c' = 5000 \text{ psi} \quad A_1 = [6.75 - (X - 0.5)] (12.5)$$

$$= (7.25 - X)(12.5)$$

$$P_u = \phi P_n = 121.8^k \leq \underbrace{0.70 (.85) (5000)}_{2.975 \text{ ksi}} [(7.25 - X)(12.5)]$$

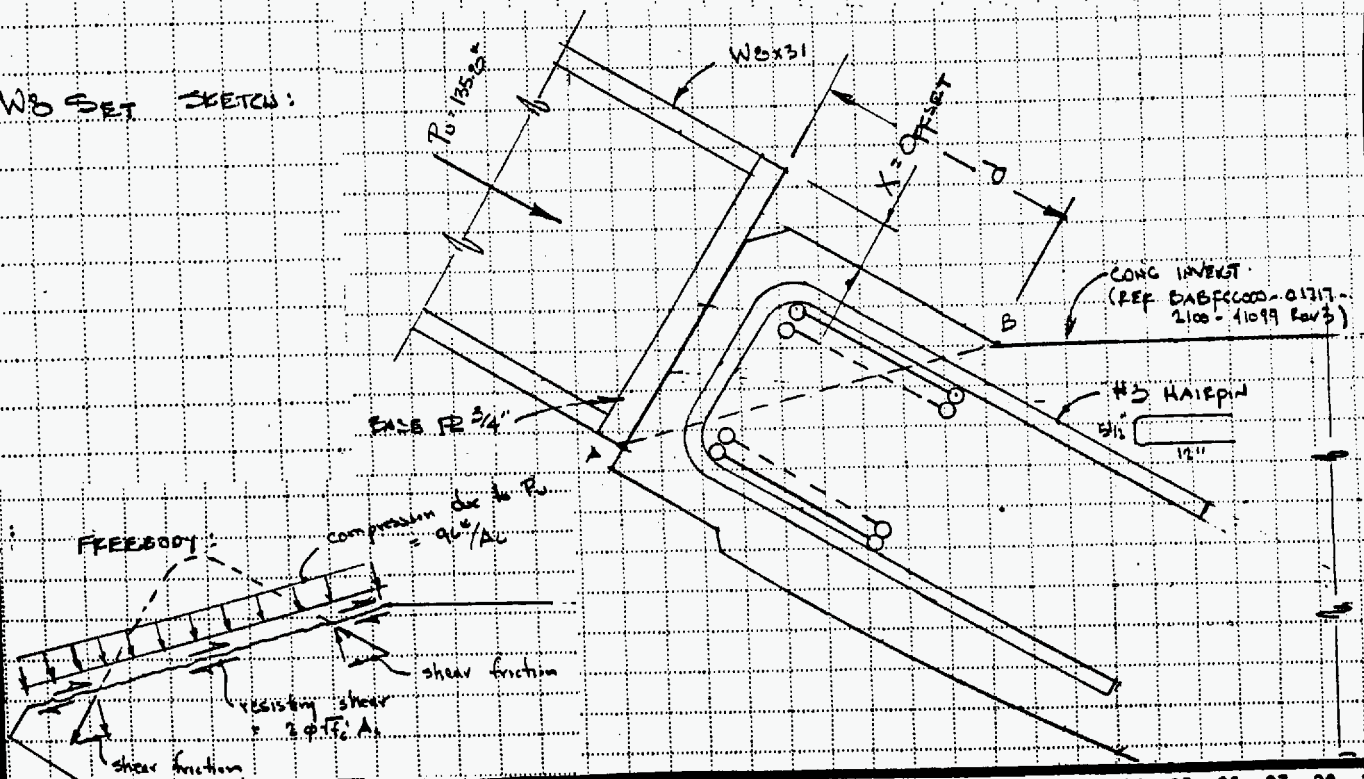
$$121.8 \leq 2.975 (7.25 - X)(12.5)$$

$$\frac{121.8}{2.975(12.5)} = 3.275 = 7.25 - X$$

$$X = 7.25 - 3.275 = 3.975 \text{ say } \underline{4"} \quad \text{---}$$

$$\text{CHECK, } \frac{121.8}{(8.40 - 7.5)(12.5)} = 2.998 \text{ ksi. bearing pressure} \approx 2.975 \text{ ksi. ASSUME OK}$$

WB SET SKETCH:



FOOT PLATE OFFSET (CONTINUED)

SHEAR FRICTION (Per ACI 318, SECTION 11.7):

FOR BOTH ENDS, $\alpha = 45^\circ$. ASSUMING #3 HAIRPIN ACTS AS SHEAR-FRICTION REINFORCEMENT, $A_{vf} = 0.11 \text{ in}^2 \times 2 = 0.22 \text{ in}^2$

ASSUME EFFECTIVE WIDTH OF CURB (IN SHEAR) IS $= b + 2d$ S.

$W_{eff} = 12.5 + 2(6.25) = 25"$ WHICH IS APPROX $\frac{1}{4}$ OF INVERT WIDTH. CONSERVATIVELY USE THIS WIDTH (DON'T FLARE @ 45°).

FOR SHEAR FRICTION REINF. ALONG (2 #3 BARS):

$$V_n = A_{vf} f_y (1.4 \sin \alpha_f + \cos \alpha_f) \quad (\text{ACI 318, SECTION 11.7.4.2})$$

$$= (0.22)(60)(1.4(1.0) \sin 45^\circ + \cos 45^\circ)$$

$$= 13.2^k (1.990 + 1.007) = 22.4^k < 121.8^k \therefore \text{ALONG AVE. CAN'T RESIST SHEAR}$$

FOR SHEAR ON SECTION, $V_c = 2 \left(1 + \frac{N_u}{200 A_g} \right) \sqrt{f'_c} A_c$ (ACI 318, SECTION 11.3.1.2)

ASSUME $1\frac{1}{4}"$ OFFSET (SELECTED TO HAVE FAILURE PNR ABOVE FT. B.):

$$A_c = 6.5' \left(\frac{1}{\sin 45^\circ} \right) (7.5") + \frac{1}{2} (6.5') (6.5') (2) \left(\frac{1}{\cos 45^\circ} \right) = 289.6 \text{ in}^2 = A_g$$

AT SIDES OF SHEAR "CORE"

$$V_c = 2 \left(1 + \frac{N_u}{200 A_g} \right) \sqrt{f'_c} \quad \text{w/ } N_u = 121.8^k \quad A_g = 289.6$$

$$= 2 \left(1 + \frac{121.8^k}{200 (289.6)} \right) \sqrt{f'_c} = 0.171 \text{ ksi}$$

$$V_{c1} = 0.171 (289.6) = 49.5^k$$

ADD NET COMPRESSION ACROSS SECTION TO V_c

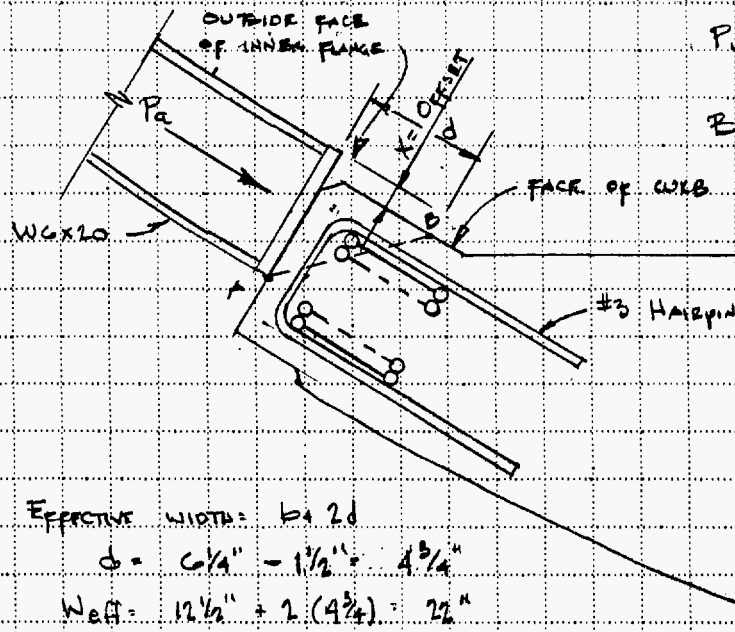
$$V_{c2} = 121.8^k \cos 45^\circ = 86.1^k \quad (\text{ACI 318, SECT 11.7.7})$$

$$V_n = 49.5^k + 86.1^k = 135.6^k$$

$$\phi V_n = 0.85 (135.6) = 115.3^k \approx V_u = 125.8 \quad (5\% \text{ UNDER})$$

\therefore MAX. OFFSET = $1\frac{1}{4}" (95\%) \approx 1\frac{1}{2}" \therefore$ USE 1" MAX. OFFSET

FOOT PLATE OFFSET (CONTINUED)



CHECK WL STEEL SET

$$P_u = P_c = 41.96^k \text{ (w/SEISMIC)} \Rightarrow \phi = 42^\circ$$

BRANCH OK BY INSPECTION

START BY ASSUMING:

$$\text{OFFSET} = X = 1\frac{1}{2}''$$

CHECK SHEAR ON SECTION

A-B

FROM PREVIOUS PAGE, SHEAR-FRICTION REIN. IS NOT SUFFICIENT.

EFFECTIVE WIDTH: $b + 2d$

$$\phi = 6\frac{1}{4}'' - 1\frac{1}{2}'' = 4\frac{3}{4}''$$

$$W_e H = 12\frac{1}{2}'' + 2(4\frac{3}{4}'') = 22''$$

$$A_c \approx (4.75'') \left(\frac{1}{\sin 45^\circ} \right) (22'') + \frac{1}{2} (4.75'')(4.75'')(2) \left(\frac{1}{\cos 45^\circ} \right) = 179.7 \text{ in}^2$$

$$V_c = 2 \left(1 + \frac{N_u}{2000 A_g} \right) \sqrt{f'_c} = 2 \left(1 + \frac{41,000}{2000 (179.7)} \right) \sqrt{5000} = 0.158 \text{ ksi}$$

$$\left. \begin{aligned} V_{c1} &= 0.158 (179.7) = 28.4^k \\ V_{c2} &= 42^k \cos 45^\circ = 29.7^k \end{aligned} \right\} V_n = V_{c1} + V_{c2} = 28.4 + 29.7 = 58.1^k$$

$$\phi V_n = 0.85 (58.1) = 49.4^k > 42.0^k \therefore 1\frac{1}{2}'' \text{ OFFSET OK FOR WL}$$

SUMMARY:

BASED ON SHEAR FAILURE OF THE INVERT CURB, AN ALLOWANCE OF 1" WILL BE SPECIFIED FOR THE MAX. OFFSET OF THE BASEPLATE TOWARD THE TUNNEL CENTERLINE FOR BOTH THE WL & WS STEEL SETS. OFFSET TO BE MEASURED FROM FACE OF INVERT CURB TO OUTSIDE FACE OF INNER FLANGE OF THE WL OR WS.

PURPOSE III.F A) STEEL SET FOOT SEGMENT CALCULATION FOR W8x31.

FOOT SEGMENT

DESIGN STEEL SET-FOOT SEGMENT

W8x31 IS "OK" FOR ROCK LONG TERM LOADS
(SEE COMPUTER OUTPUT)

CHECK THE CONSTRUCTION LOADS - USING 25 TONS
JACK AND 27 TONS DESIGN LOAD.

$$P_a = 27 \text{ T} \times 2 \text{ K/T}$$

$$P_a = 54 \text{ K}$$

$$M = \frac{54(6)}{12} = 27 \text{ FT-K}$$

FOR W8x31

$$A_1 = 9.13 \text{ IN}^2$$

$$I_1 = 110 \text{ IN}^4 \quad S = 27.5 \text{ IN}^3$$

$$f_{bx} = \frac{27 \times 12}{27.5} = 11.78 \text{ KSI}$$

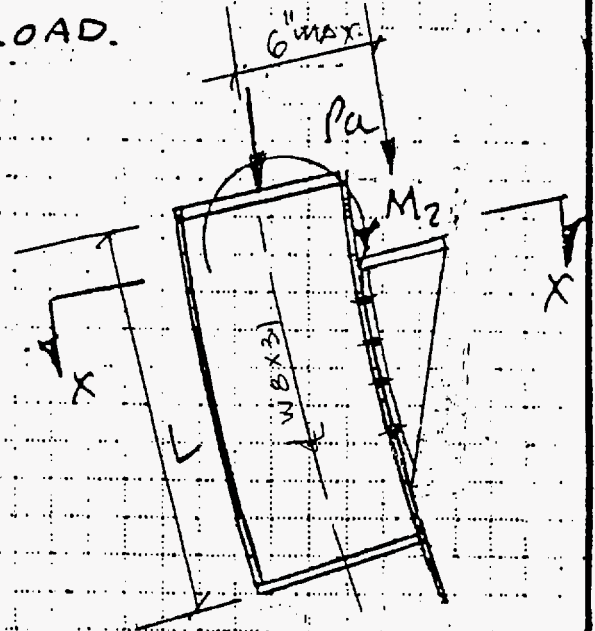
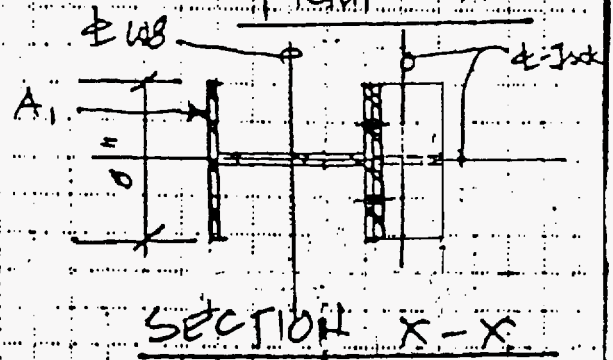


FIGURE-A



Purpose III. F

W8x31 FOOT SEGMENT

DESIGN PARAMETERS

$$L = 12 - 0 \text{ MAX (TRIAL DIMENSION)}$$

$$A = 9.13 \text{ in}^2, I = 110.0 \text{ in}^4$$

$$r_x = 3.47$$

$$r_y = 2.02$$

$$f_a = \frac{P_a}{A} = \frac{54.00}{9.13} = 5.91 \text{ ksi}$$

$$\frac{KL}{r_y} = \frac{(1)(12 \times 12)}{2.02} = 71.3 \quad F_a = 16.3 \text{ ksi} \quad (\text{AISC TABLE C-36})$$

$$f_a / F_a = \frac{5.91}{16.3} = 36.3\% > 15\% \text{ CHECK AISC (H1-142)}$$

$$\frac{f_a}{F_a} + \frac{C_{mx} f_{bx}}{(1 - \frac{f_a}{F_{ex}}) F_{bx}} \leq 1.0 \quad \text{--- AISC (H1-1)}$$

$$KL/r_b = \frac{1.0 \times 144}{3.47} = 41.5 \quad F'_{ex} = 86.7 \quad \text{--- AISC P5-122}$$

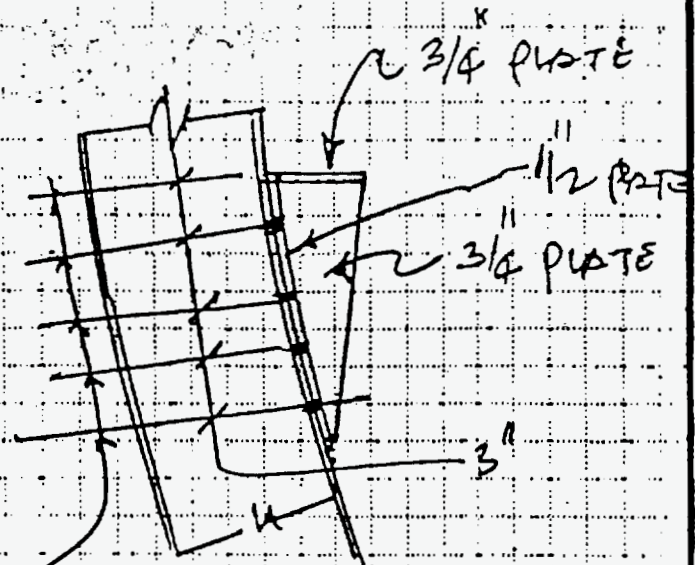
$$0.336 + \frac{1.0 \times 11.78}{(1 - \frac{5.91}{86.7}) \times 21.6} = 0.875 < 1.0 \quad \text{--- O.K.}$$

PURPOSE III. E. FOR W8X31 FOOT SEGMENT

$$f_a / 0.6 F_y + \frac{f_{bx}}{F_{bx}} \text{ ---- AISC (H1-2)}$$

$$\frac{5.91}{21.6} + \frac{11.78}{21.6} = 0.82 < 1.0 \text{ ---- OK.}$$

∴ USE W8X31 WITH MINIMUM JACKING
BRACKET AS SHOWN ON
FIGURE A AND MAXIMUM LENGTH 12'-0"



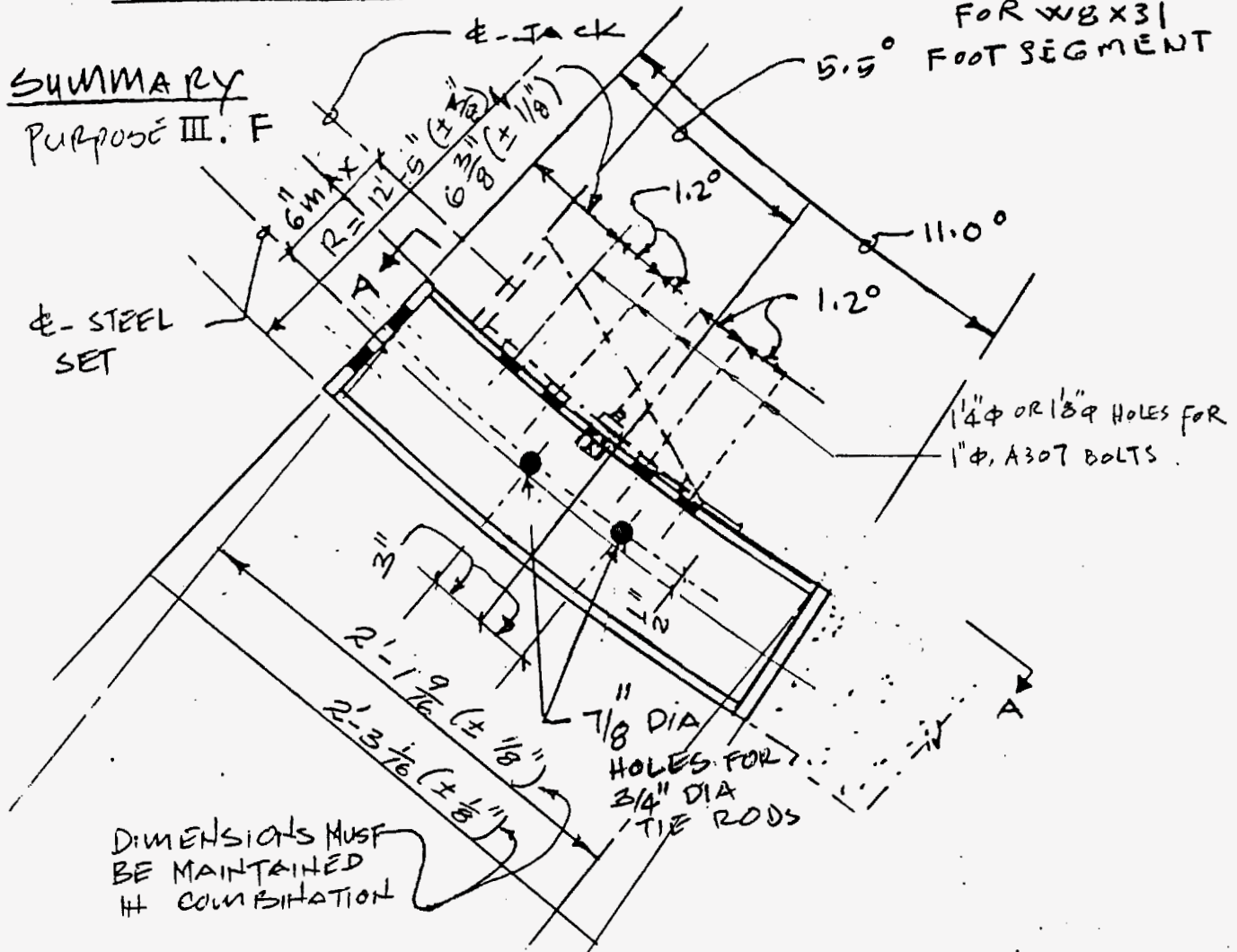
6-B-1" DIA
BOLTS A307 &
1/4" φ OR 1/8" φ
HOLES

FIGURE-A

TITLE: ESF Ground Support - Structural Steel Analysis

SUMMARY

Purpose III: F

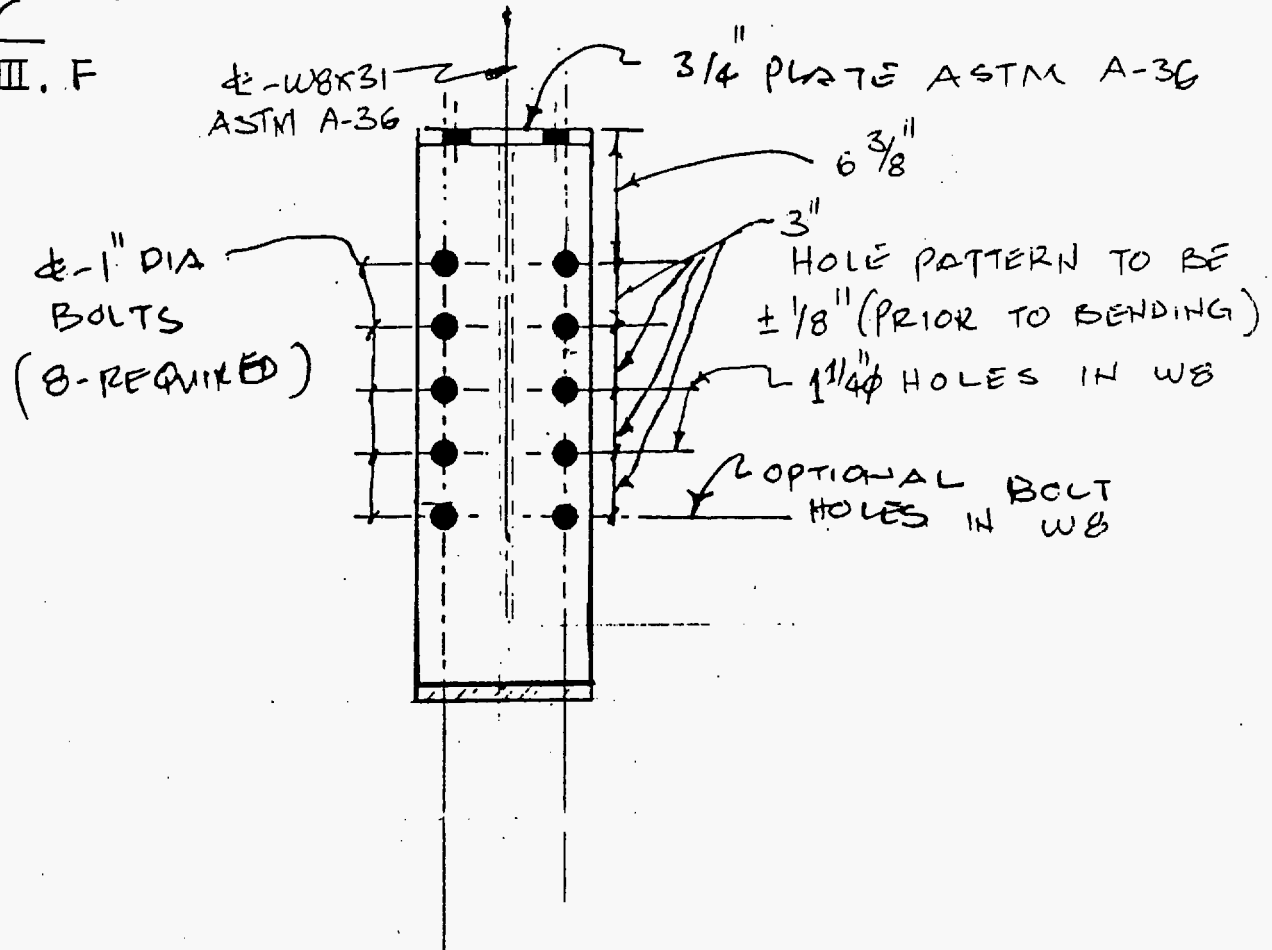


STEEL SET FOOT SEGMENT

FOR W8X31 FOOT SEGMENT

SUMMARY

PURPOSE III. F

SECTION A-A

PURPOSE III.F b) STEEL SET FOOT SEGMENT CALCULATION - FOR W6 x 20
FOOT SEGMENT

DESIGN STEEL SET-FOOT SEGMENT

W8 x 31 IS "OK" FOR LONG TERM LOADS
(SEE COMPUTER OUTPUT)

CHECK THE CONSTRUCTION LOADS - USING 15 TONS

JACK AND 17 TONS DESIGN LOAD.

$$P_a = 17 \text{ T} \times 2^{1/2}$$

$$P_a = 34 \text{ K}$$

$$M = \frac{34(5)}{12} = 14.17 \text{ FK}$$

FOR W6 x 20

$$A_1 = 5.87 \text{ IN}^2$$

$$I_1 = 41.4 \text{ IN}^4$$

$$S = 13.4 \text{ IN}^3$$

$$f_{bx} = \frac{14.17 \times 12}{13.4} = 12.69 \text{ KSI}$$

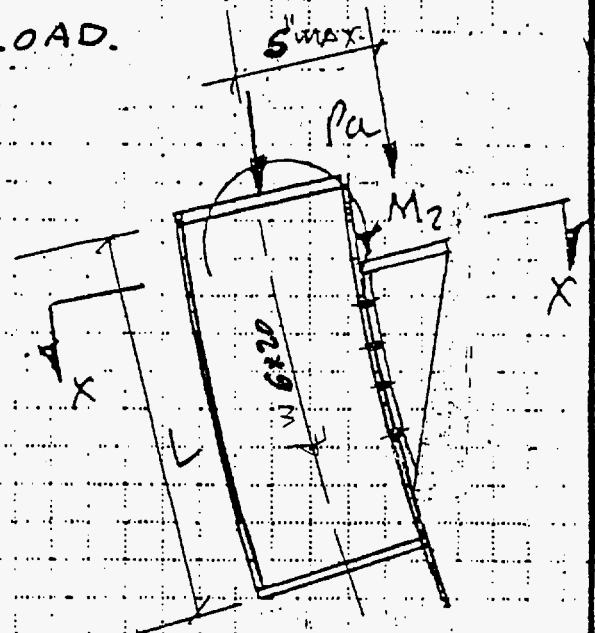
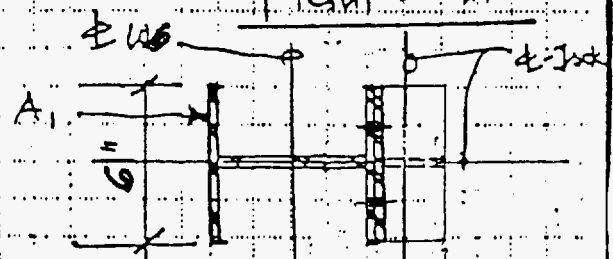


FIGURE-A



SECTION X-X

PURPOSE III. F4x20 FOOT SEGMENTDESIGN PARAMETERS

$$L = 12' - 0" \text{ MAX (TRIAL DIMENSION)}$$

$$A = 5.87 \text{ in}^2, \quad I = 41.4 \text{ in}^4$$

$$r_x = 2.66$$

$$r_y = 1.5$$

$$f_a = \frac{P_a}{A} = \frac{34.00}{5.87} = 5.79 \text{ ksi}$$

$$\frac{KL}{r_y} = \frac{(1)(12 \times 12)}{1.5} = 96 \quad F_a = 13.48 \text{ ksi} \quad (\text{AISC TABLE C-36})$$

$$f_a/F_a = \frac{5.79}{13.48} = 42.95\% > 15\% \quad \text{CHECK AISC (H1-142)}$$

$$\frac{f_a}{F_a} + \frac{C_{mx} F_{bx}}{(1 - \frac{f_a}{F_{ex}}) F_{bx}} \leq 1.0 \quad \text{--- AISC (H1-1)}$$

$$K L/r_b = \frac{1.0 \times 14.4}{2.66} = 54.14 \quad F'_{ex} = 50.8 \quad \text{--- AISC P5-122}$$

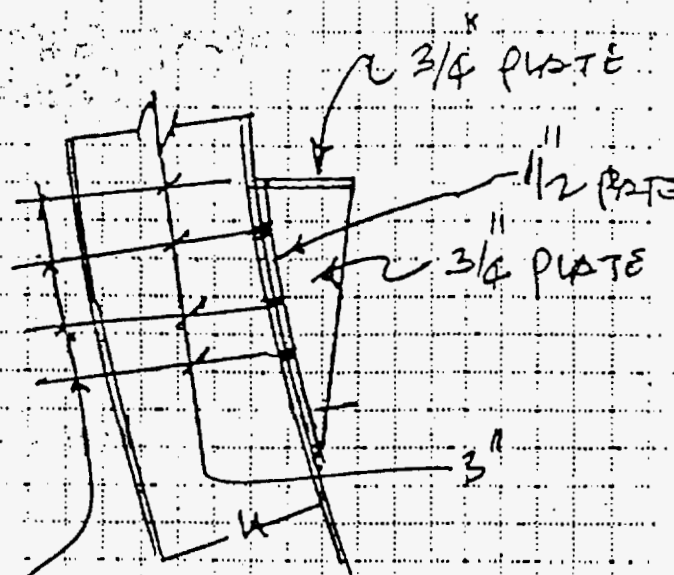
$$0.287 + \frac{1.0 \times 12.62}{(1 - \frac{5.79}{50.8}) \times 21.6} = 0.95 < 1.0 \quad \text{--- O.K.}$$

PURPOSE III F FOR W6X20 FOOT SEGMENT

$$\frac{f_a}{0.6F_y} + \frac{f_{bx}}{F_{bx}} \text{ ---- AISC (H1-2)}$$

$$\frac{5.79}{21.6} + \frac{12.69}{21.6} = 0.85 < 1.0 \text{ ---- OK}$$

USE W6 X 20 WITH MINIMUM JACKING
BRACKET AS SHOWN ON
FIGURE A AND MAXIMUM LENGTH 12'-0"

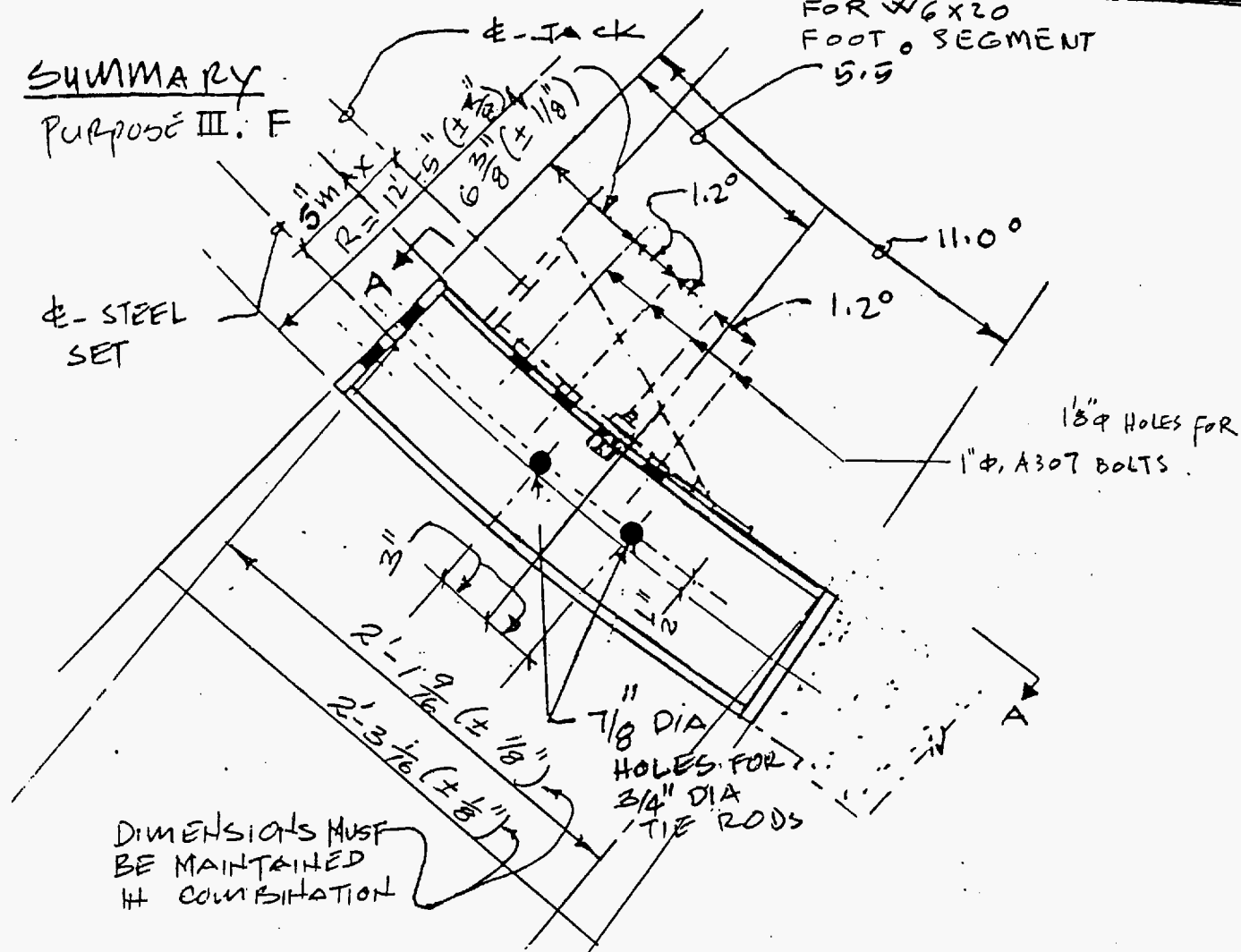


6-1" DIA
BOLTS A307 &
1 1/8" HOLES.

FIGURE-A

SUMMARY

PURPOSE III: F

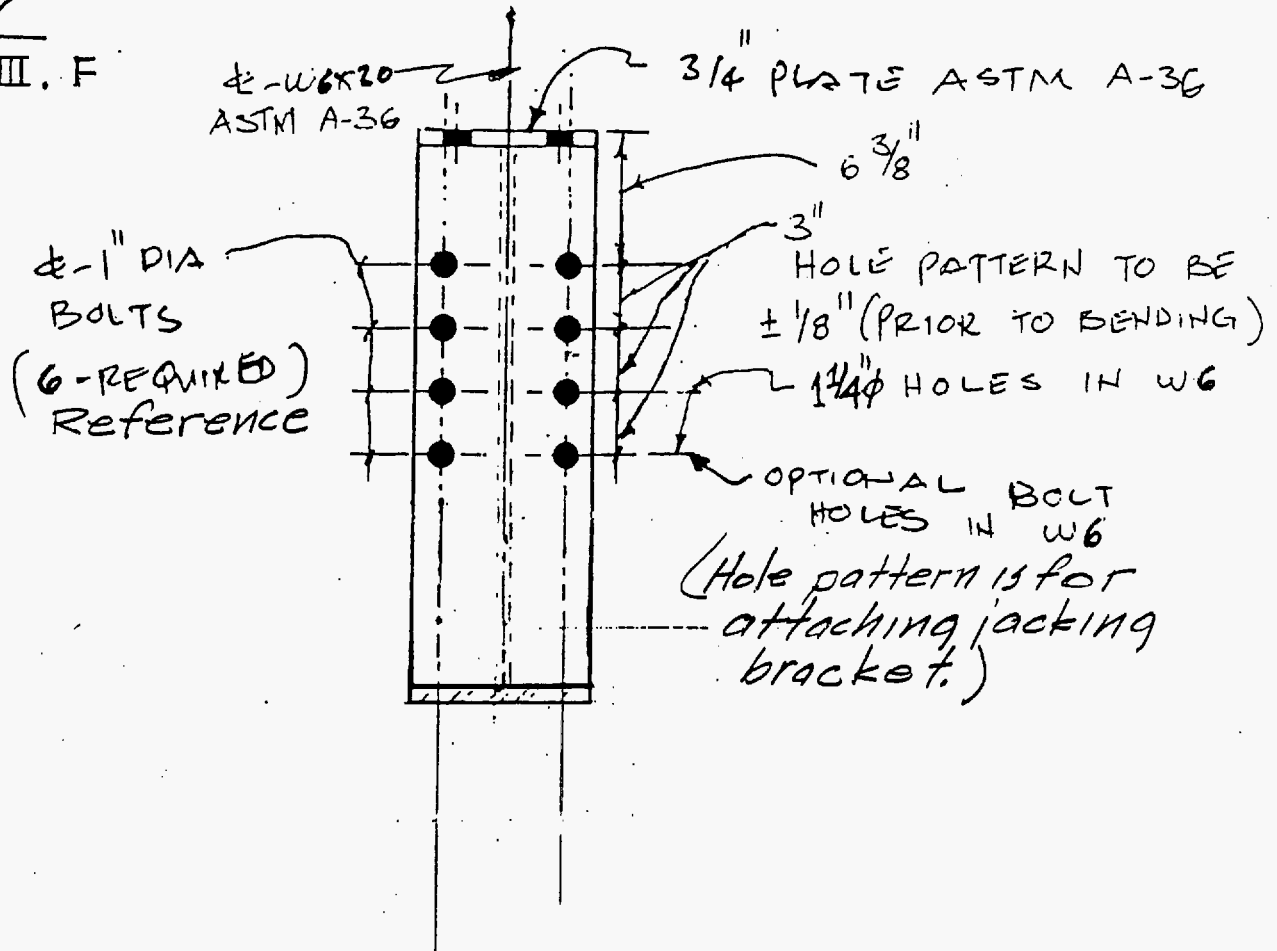


STEEL SET FOOT SEGMENT

FOR W6X20 FOOT SEGMENT

SUMMARY

PURPOSE III. F

SECTION A-A

PURPOSE III G CONNECTION BETWEEN STEEL SET SEGMENTS CALCULATION

A) FOR W8X31 STEEL SETS

SPlice LOCATIONS ARE AT NODES 27 AND 15.

CRITICAL LOADS AND LOCATIONS:

CASE 1) SEISMIC LOADING AT STATION 18+00, NODE 15:

SPACING 9'-0"

$$\text{SHEAR} = 12,970 \text{ N.} \quad \text{FACTORED} = 12,970 \times 1.22 \times 0.225 = 3,560 \text{ N}$$

$$\text{AXIAL} = 252,100 \text{ N.} \quad \text{FACTORED} = 252,100 \times 1.22 \times 0.225 = 69,200 \text{ N}$$

$$\text{MOMENT} = 2.14 \text{ NM} \quad \text{FACTORED} = 2.14 \times 1.22 \times 0.738 = 1.93 \text{ NM}$$

CASE 2) STATIC LOADING AT STATION 7+00, NODE 15:

SPACING 9'-0"

$$\text{SHEAR} = 1,876 \text{ N.} \quad \text{FACTORED} = 1,876 \times 1.22 \times 0.225 = 510 \text{ N}$$

$$\text{AXIAL} = 5,860 \text{ N.} \quad \text{FACTORED} = 5,860 \times 1.22 \times 0.225 = 1,610 \text{ N}$$

$$\text{MOMENT} = 0.289 \text{ NM} \quad \text{FACTORED} = 0.289 \times 1.22 \times 0.738 = 0.26 \text{ NM}$$

CASE 3) SEISMIC LOADING AT STATION 10+00, NODE 27

SPACING 6'-0"

$$\text{SHEAR} = 15,110 \text{ N.} \quad \text{FACTORED} = 15,110 \times 0.61 \times 0.225 = 2,070 \text{ N}$$

$$\text{AXIAL} = 1,069,000 \text{ N.} \quad \text{FACTORED} = 1,069,000 \times 0.61 \times 0.225 = 146,760 \text{ N}$$

$$\text{MOMENT} = 4.773 \text{ NM} \quad \text{FACTORED} = 4.773 \times 0.61 \times 0.738 = 2.15 \text{ NM}$$

REVIEW OF THE ABOVE LOADING AND COMPARISON OF THE ABOVE LOADING WITH THE JACKING LOADS INDICATES THAT JACKING LOADS GOVERNS THE DESIGN OF BOLTS FOR THE SPlice CONNECTION. (SEE THE FOLLOWING CALCULATION SHEETS.

PURPOSE III.G CONNECTION BETWEEN STEEL SET SEGMENTS CALCULATION

The splice design is controlled by the jacking loading conditions. The joint at the connection point is modeled in the computer input as a fixed joint. The axial force, shear, and bending moment used for design of the connection are based on the file 5TLRV3A (Attachment I) which produces the maximum tensile stresses in the connection bolts.

PURPOSE III. G A) CONNECTION BETWEEN STEEL SET SEGMENTS CALCULATION

FOR W8x31

DESIGN OF STEEL SET SPLICE CONNECTION:

THE CRITICAL DESIGN LOADS AT THE
CONNECTION ARE PRODUCED BY JACKING
LOADS (STLRV3A) JOINT 16 MEMBER 15

$$P = -4.16^k \text{ COMPRESSION}$$

$$V = 9.44^k \text{ SHEAR}$$

$$M = 9.11^k \text{ MOMENT}$$

$$\sum M_{CA} = 0$$

$$9.11^k \times 12 - (5.283 T_1 + 2.283 T_2) - 4.16 \times 3.783 = 0$$

$$T_1 + 0.432 T_2 + 8.78 = 0 \quad \text{--- (1)}$$

AND,

$$T_1 / T_2 = 5.283 / 2.283$$

$$T_1 = 2.314 T_2$$

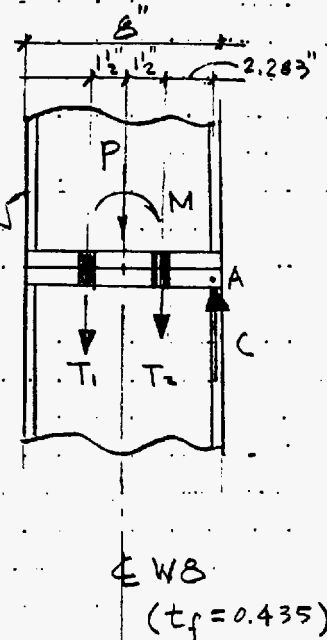
FROM EQ. (1)

$$2.314 T_2 + 0.432 T_2 + 8.78 = 0$$

$$T_2 = -3.2^k \text{ (COMPRESSION)}$$

$$T_1 = -7.4^k \text{ (COMPRESSION)}$$

THE COMPRESSION FORCES AT BOLTS INDICATE NO BOLT TENSION
AND THE COMPRESSION FORCES ARE ACTUALLY TAKEN
BY BEARING BETWEEN PLATES.



PURPOSE III G A) CONT'D.

CHECK STRESS IN BOLT ~

USING 1" ϕ A307 BOLTS, AREA FOR TENSILE STRESS = 0.606 in^2 --- P. 4-147 AISC

TENSION STRESS IN BOLT = 0

$$\text{SHEAR STRESS IN BOLT} = \frac{9.44 \text{ K}}{(4) \text{ BOLTS} \times 0.7854} = 3.0 \text{ ksi} = F_v$$

ALLOWABLE SHEAR $F_v = 11.0 \text{ ksi} > F_v = 3.0 \text{ ksi}$ --- O.K.
 --- (AISC PAGE 4-5)

USE (4) - 1" ϕ A-307 BOLTS.CHECK END PLATE AT SPLICE CONNECTION ~ (END PLATE THICKNESS = $\frac{3}{4}$ ")

MAX. BENDING IN PLATE = 0

WELD OF END PLATE TO STEEL SET,

USE MINIMUM: $\sqrt{\frac{1}{4}}$ --- (AISC TABLE J2-4)WELD OF WEB TO END PLATE:

MAX. SHEAR = 3.56 K (SEIR. LOAD AT STATION 12+00 - NODE 15 - STEEL SET AT 4'-0")
 FOR $\frac{1}{4}$ " FILLET WELD $\times 2$ " LONG - 2 SIDES:

ALLOW WELD CAP = V_A

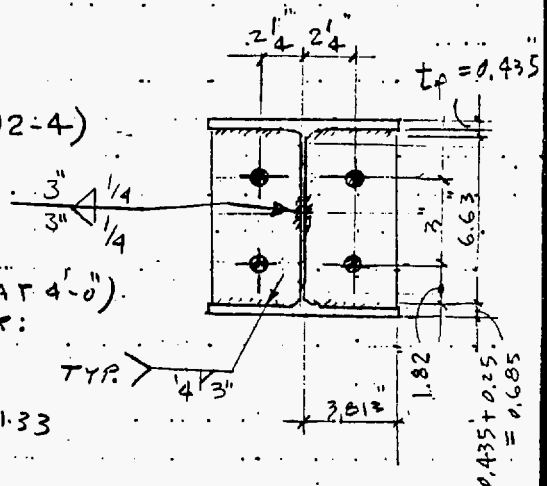
$$V_A = (0.3 \times 70 \text{ ksi}) (0.25 \text{ in} \times \cos 45^\circ) (2 \times 3 \text{ in}) \times 1.33$$

$$= 29.6 \text{ K} >> 3.56 \text{ K} \quad \text{O.K.}$$

USE $\frac{3}{4}$ " PLATE, A36 AT EACH END OF W8
 AND $\frac{1}{4}$ " FILLET WELD AS SHOWN.

WELD OF FLANGE TO END PLATE:

THE STEEL SET IS IN FULL COMPRESSION AND REQUIRES NO STRENGTH WELD AT FLANGE.



HOWEVER, FOR GOOD DESIGN PRACTICE USE $\sqrt{\frac{1}{4}}$ AS SHOWN.

SUMMARY

PURPOSE III.G

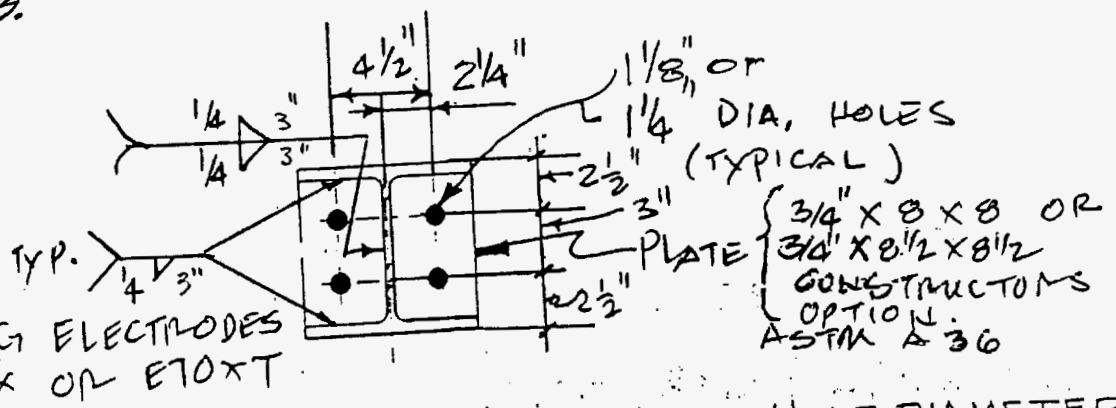
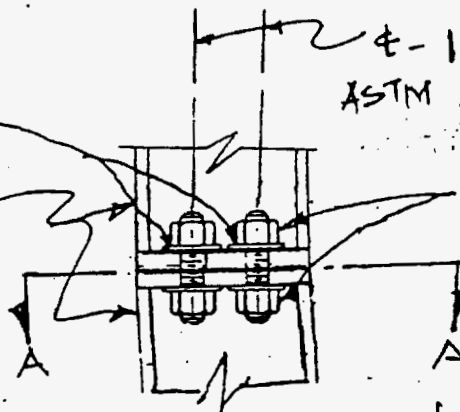
A) FOR W8X31 STEEL SETS

WASHER
TYPE-1
ASTM F 436 (TYP)
(Optional Under
Bolt Head) W8 X 31
ASTM-A36

Washer & nut
are selected
based on com-
patibility
with ASTM
A307 Bolts.

ϕ -1" DIA BOLTS
ASTM A 307 MINIMUM.

NUTS
HEAVY HEX. GRADE DH
ASTM A563



NOTE: HOLE DIAMETER
1 1/8" OR 1 1/4" SHALL BE AT
CONSTRUCTOR'S
OPTION.

SECTION A-A

PURPOSE II G. B) CONNECTION BETWEEN STEEL SET
SEGMENT CALCULATIONS FOR W6 X 20 STEEL SETS

MOST CRITICAL LOAD CONDITION FOR THE SPLICE:

LOCATIONS: NODE 5 27 AND NODE 15

CRITICAL LOADING CONDITION:

CASE 1) STATIC LOADING AT STATION 53+00, NODE 15

SPACING 4'-0"

SHEAR 2566 N FACTORED $= 2.566 \times 1.22 \times 0.225 = 0.709 \text{ K}$

AXIAL 52,550 " $= 52.55 \times 1.22 \times 0.225 = 14.92 \text{ K}$

MOMENT 573.4 NM " $= 0.573 \times 1.22 \times 0.738 = 0.52 \text{ K}$

CASE 2) STATIC LOADING AT STATION 7+00, NODE 15

SPACING 4'-0"

SHEAR 691.4 N " $= 0.691 \times 1.22 \times 0.225 = 0.190 \text{ K}$

AXIAL 18440 N " $= 18.44 \times 1.22 \times 0.225 = 5.06 \text{ K}$

MOMENT 246.7 NM " $= 0.247 \times 1.22 \times 0.738 = 0.226 \text{ K}$

CASE 3) STATIC LOADING AT STATION 53.0, NODE 15

SPACING 4'-0"

SHEAR 2041 N " $= 2.041 \times 1.22 \times 0.225 = 0.560 \text{ K}$

AXIAL 37,750 N " $= 37.75 \times 1.22 \times 0.225 = 10.36 \text{ K}$

MOMENT 654.4 NM " $= 0.654 \times 1.22 \times 0.738 = 0.589 \text{ K}$

PURPOSE III G B) CONNECTION BETWEEN STEEL SET
SEGMENT CALCULATIONS FOR W6X20 STEEL SETS (CONT'D)

JACKING CONDITION LOADS:

REF. COMPUTER RUN FOR 15 TON JACKING ATTACHMENT VII
"PROGRAM STLRV3". JOINT 16 MEMB. 15

$$P_2 = -23.81^k \quad V_y = -5.54^k \quad M_2 = 5.51^k$$

BY COMPARISON OF THE JACKING LOADS TO STATIC
AND SEISMIC LOADING, JACKING LOAD WILL GOVERN
THE CONNECTION DESIGN.

CONNECTION DESIGN

TRY 2 - 1" ϕ BOLTS AND 5/8" THK END PLATES.

$$\sum M_A = 0$$

$$23.81 \times 2.92 + T \times 2.92 = 5.51 \times 12$$

$$2.92T = 66.12 - 69.52$$

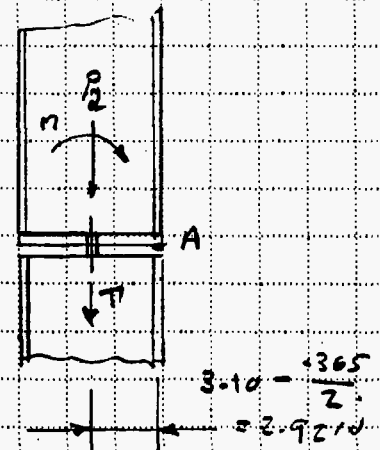
$$T = -1.17^k \therefore \text{BOLTS ARE IN TENSION}$$

CHECK BOLTS FOR SHEAR;

$$V_8 = \frac{5.54^k}{2 \text{ BOLTS}} = 2.77^k/\text{BOLT} < 7.9^k/\text{BOLT} \times 0.4$$

* ALLOW SHEAR FOR 1" ϕ A307 BOLT PER AISC TABLE I-D

\therefore 2 - 1" ϕ A307 BOLTS O.K.
FOR SPLICE LOCATION



PURPOSE III G B) SPLICE CONNECTION FOR W6X20 (CONTINUED)

CHECK END PLATE FOR SPLICE CONNECTION: ($\frac{5}{8}$ " THICK)

MAXIMUM BENDING IN PLATE = 0

$\therefore \frac{5}{8}$ " THICK PLATE O.K. FOR BENDING.

WELD OF PLATE TO STEEL SET:

MAX. WELD SIZE \leq W6X20 WEB THICKNESS

$\leq \frac{1}{4}$ " (AISC 5-67)

TRY $\frac{3}{16}$ " FILLET WELD 2" LONG EACH SIDE OF THE WEB TO RESIST SHEAR FORCES.

CAPACITY OF 2 WELDS = V

$$V = (0.3 \times 70 \text{ ksi}) \left(\frac{3}{16} \cos 45^\circ \right) \times 2 \text{ SIDES} \times 2 \text{ IN} = 11.14 \text{ K}$$

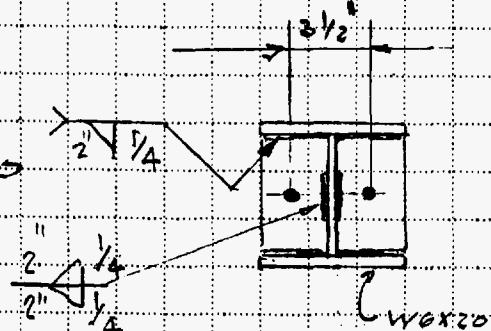
$$\text{MAX. SHEAR} = 5.54 \text{ K} < 11.14 \text{ K}$$

WELD OF FLG TO END PL:
(SEE PAGE III-97)

$\therefore \frac{3}{16}$ " WELD X 2" LONG AT EACH SIDE OF THE WEB MIN. TO RESIST MAXIMUM SHEAR FORCES

USE $\frac{5}{8}$ " THICK A36 PLATE WITH $\frac{1}{4}$ " FILLET WELD AS SHOWN ON EACH SIDE OF SPLICE CONNECTION

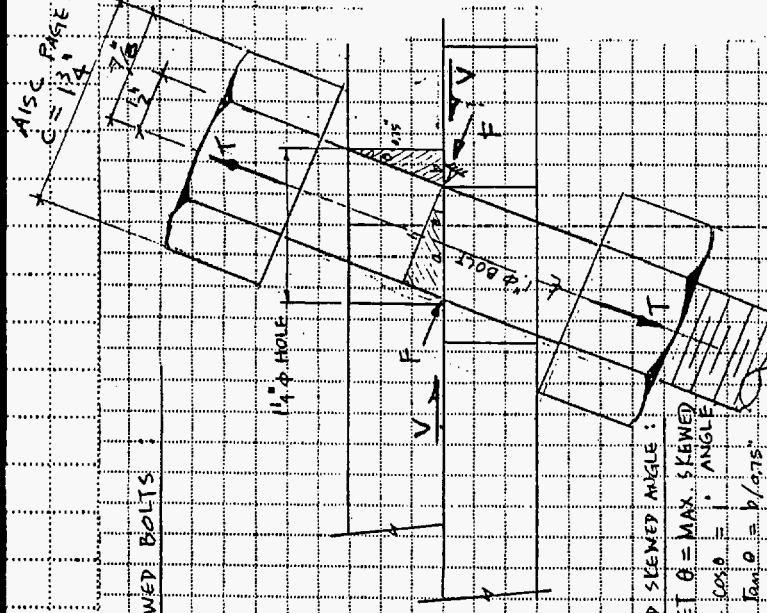
TYP.
FLG.
WELD



Title: ESF Ground Support - Structural Steel Analysis

AISC PAGE 4-142
 $C = 13.4$

SKewed BOLTS



a. FIND SKEWED ANGLE:

LET θ = MAX. SKEWED ANGLE

$$\left\{ \begin{array}{l} a \cos \theta = 1 \text{ ANGLE} \\ \tan \theta = b/a \end{array} \right.$$

$$\left\{ \begin{array}{l} a + b = 1.25 \\ a \cos \theta = 1 \end{array} \right.$$

$$\cos \theta = 1 / 1.25 \cos \theta = 1.25$$

$$\frac{1}{\cos \theta} = 1.25 \sin \theta = 1.25$$

$$\tan \theta = 1.25 \sin \theta = 1.25 \cos \theta$$

$$(0.75) / 1.25 \cos \theta = 1.25 \cos \theta = 1$$

$$0.5625 (1 / \cos^2 \theta) = 1.25 \cos^2 \theta = 2.5 \cos^2 \theta$$

$$2.125 \cos^2 \theta = 2.5 \cos^2 \theta + 0.375 = 0$$

$$\cos^2 \theta = 2.5 \pm \sqrt{6.25 - 3.719} = 2.5 \pm 1.59$$

$$\cos \theta = 4.25$$

$$\cos \theta = 0.962 \text{ OR } 0.214$$

MAX. SKEWED ANGLE = 15.85°

NOTE:

$$F = V \cos \theta = 2.36 \cos 15.85^\circ = 2.27"$$

$$T = V \sin \theta = 2.36 \sin 15.85^\circ = 0.64"$$

$$M = F a \sin \theta = (\text{SEE BELOW}) = 0.44"$$

b. BENDING IN SKEWED BOLT

USING 1" A307 BOLT IN 1 1/4" MAX. HOLE.

THE TENSION IN BOLT AT SNUG TIGHT CONDITION ≈ 0

(PER TELEPHONE CONVERSATION WITH AISC ENGINEER STAFF) (SEE VI-9)

THE BENDING IN THE SKEWED BOLT DUE TO BOLT TENSION IS NEGLIGIBLE

CONSIDER BENDING IN THE SKEWED BOLT DUE TO SHEAR

MAX. SHEAR AT CONNECTION = $2.44"$ (PAGE III-9C)

(JACKING CONDITION)

$$\text{MAX. SHEAR PER BOLT} = 2.44 / 4 \text{ BOLTS} = 0.61" = V$$

FROM THE FREE BODY OF THE UPPER HALF OF THE BOLT (SEE DETAIL)

$$F = \text{MAX BOLT SHEAR} = V \cos \theta = 0.56 \cos 15.85^\circ$$

$$F = 0.54"$$

$$\text{MOMENT IN BOLT} = F x (a \sin \theta) = 0.54 \times (1.04 \sin 15.85^\circ) = 0.14"$$

SECTION MODULUS OF THREAD BOLT

$$= \frac{\pi d^3}{32} = \frac{\pi (0.875)^3}{32} = 0.06 \text{ in}^3$$

$$f_t = f_b + \frac{M}{I} = 10.7 + 0.14 / 0.06 = 11.5 \text{ ksi} < F_u = 20 \text{ ksi} \text{ --- AISC PG 4-3}$$

where $f_b = \frac{M}{I} = \frac{0.14}{0.06} = 2.33 \text{ ksi}$ ALLOWABLE TENSILE STRESS (ALSO SEE BELOW)

$$f_t = 10.7 + 0.14 / 0.06 = 11.5 \text{ ksi}$$

CHECK COMPRESSIVE STRESS (AISC J3.5 & TABLE J3.3)

$$f_u = \frac{V}{A} = \frac{2.36}{0.61} = 3.87 \text{ ksi} < F_u = 20 \text{ ksi}$$

$$F_t = 20 - 1.5 f_u = 17.7 \text{ ksi}$$

$$F_t = 20 - 1.5 (3.87) = 14.2 \text{ ksi}$$

$$F_t = 14.2 \text{ ksi} < F_u = 20 \text{ ksi}$$

$$F_t = 14.2 \text{ ksi} < F_u = 20 \text{ ksi}$$

$$F_t = 14.2 \text{ ksi} < F_u = 20 \text{ ksi}$$

$$F_t = 14.2 \text{ ksi} < F_u = 20 \text{ ksi}$$

$$F_t = 14.2 \text{ ksi} < F_u = 20 \text{ ksi}$$

$$F_t = 14.2 \text{ ksi} < F_u = 20 \text{ ksi}$$

$$F_t = 14.2 \text{ ksi} < F_u = 20 \text{ ksi}$$

$$F_t = 14.2 \text{ ksi} < F_u = 20 \text{ ksi}$$

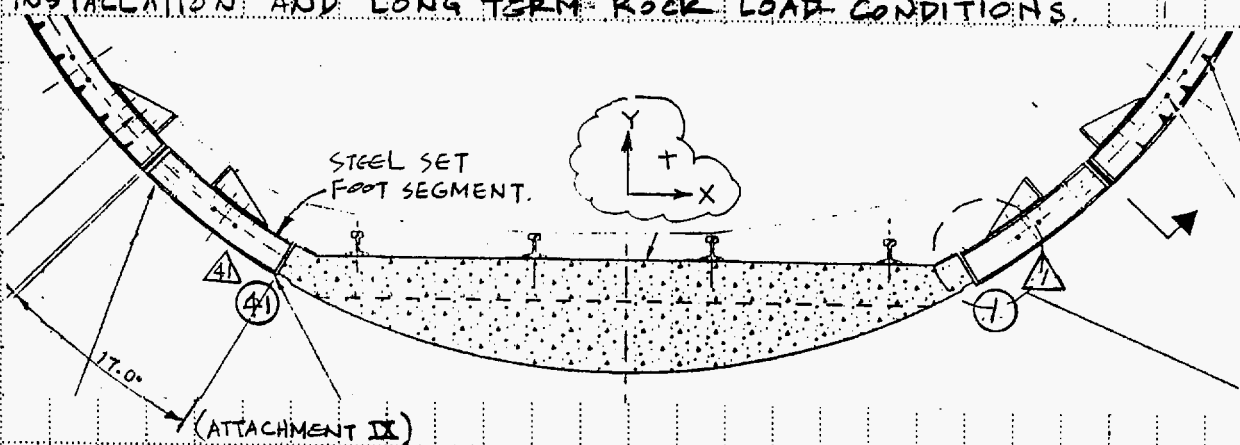
$$F_t = 14.2 \text{ ksi} < F_u = 20 \text{ ksi}$$

$$F_t = 14.2 \text{ ksi} < F_u = 20 \text{ ksi}$$

THE SKEWED BOLT IS OK AS SHOWN

PURPOSE III.H.STABILITY OF STEEL SET FOOT SEGMENT:

THE STEEL SET FOOT SEGMENTS ARE SUPPORTED ON CONCRETE INVERT AS SHOWN BELOW. THE FOOT SEGMENT MUST BE STABLE DURING JACKING INSTALLATION AND LONG TERM ROCK LOAD CONDITIONS.

TUNNEL SET ELEVATION

△ ≡ MEMBER
○ ≡ NODE

<A> LONG TERM ROCK LOAD CONDITION:

THE STEEL SET FOOT SUPPORT POINTS ON CONCRETE INVERT ARE AT NODES 01 AND 41 IN COMPUTER MODEL (SEE ATTACHMENT II).

THE STEEL SET FOOT SEGMENT STABILITY ANALYSIS AGAINST SLIDING IS PRESENTED IN THE FOLLOWING PAGES.

This analysis compares the average axial force in the steel set and concrete invert with the maximum shear force generated in the lower elements of the steel set. The average axial force is used because the steel set and invert exhibit ring compression. As modeled in FLAC, the rock squeezes the steel set into an oval shape, developing compressive forces in the sides of the set and tensile forces in the top of the set and in the invert. The average of these forces represents the axial force distributed throughout the steel set and invert. The maximum shear in the lower elements of the steel set was selected from the shear diagrams shown in Reference 5.20. As shown in the diagrams, the maximum shear forces in the steel set occur at locations above the springline where utilities are supported. These shear forces are absorbed by the surrounding rock and are not applicable to determine the sliding of the steel set on the concrete invert. To be conservative, the maximum shear in an area near the steel / concrete interface was found by looking at the FLAC data in Attachment II and determining the cutoff point where the shear begins to decrease in value. For this analysis, the lower elements of the steel set refer to the segments between elements 35 and 40 and between elements 1 and 6.

FILE: M07K250W.SAV. AT STATION TCW 7+00 (II-10 to II-12)
 STEEL SET W8 x 31 @ 4'-0" O.C.
 LOADING: STATIC DL + UTIL

TOTAL AXIAL FORCE OF 48 ELEMENTS

$$\Sigma F = 236.05 \times 10^4 \text{ NEWTONS PER SPACING @ ONE METER}$$

AVERAGE AXIAL FORCE ALONG THE STEEL SET

$$= \frac{\Sigma F}{48 \text{ ELEMENTS}}$$

$$= \frac{236.05 \times 10^4}{48} = (4.918 \times 10^4 \text{ NEWTONS}) \times (2.2481 \times 10^{-4} \text{ KIIPS})$$

$$= 11.06 \frac{\text{KIIPS}}{\text{METER SPACING}} \times \frac{1 \text{ m}}{3.281 \text{ ft}} \times 4 \text{ ft} = 13.48 \text{ K @ 4' SPACING}$$

MAX SHEAR IN BOTTOM ELEMENTS OF STEEL SET (BETWEEN
 NODES 35 TO 40 AND NODES 1 TO 6) = $4.972 \times 10^3 \text{ N (ELEM 38)}$
 = 1.36 kips @ 4' spacing

FRICITION FORCE AT BOTTOM OF STEEL SET FOOT SEGMENT

$$= \mu N; \mu = 0.3 \text{ BETWEEN CONCRETE & STEEL (REF. 5.17, p. 275)}$$

$$= 0.3 \times 13.48 = 4.04 \text{ K} >> 1.36 \text{ K MAX. SHEAR}$$

---- O.K.

NO SLIDING @ STATION TCW 7+00 (W8 SET @ 4'-0")

OVERALL FACTOR OF SLIDING = $\frac{\text{FRICTION FORCE}}{\text{RESISTANCE}}$

$$\text{F.S.R.} = \frac{4.04}{1.36} = 2.97$$

ALL OTHER STATIONS ALONG THE MAIN DRIET USING W8 x 31
 STEEL SETS ARE SUMMARIZED IN PAGE III-107. ALL FRICTION FORCES
 ARE LARGER THAN THE SHEAR IN THE FOOT SEGMENT.
 NO ANCHORAGE IS REQUIRED. THE LOWEST FACTOR OF SLIDING
 RESISTANCE FOR THE W8 x 31 STEEL SETS IS 2.97 (M07K250W). THIS IS
 A VERY CONSERVATIVE FACTOR BASED ON STANDARD ENGINEERING

PRACTICE AND IS THEREFORE REASONABLE.

FILE: M07_K2.SAV AT STATION TCW 7+00 (II-18 to II-50)
 STEEL SET W6x20 @ 4'0" O.C.
 LOADING: STATIC: DL+UTIL

TOTAL AXIAL FORCE OF 48 ELEMENTS

$$\sum F = 9.991 \times 10^5 \text{ NEWTONS PER ONE METER SPACING}$$

AVERAGE AXIAL FORCE ALONG THE STEEL SET

$$= \frac{\sum F}{48 \text{ ELEMENTS}}$$

$$= \frac{9.991 \times 10^5}{48} = (9.357 \times 10^3 \text{ N}) (2.2481 \times 10^{-4} \text{ kips/N})$$

$$= 2.103 \text{ kips} \times \frac{1 \text{ m}}{3.281 \text{ ft}} \times 4 \text{ ft} = 2.561 \text{ kips} \quad @ 4' \text{ SPACING}$$

MAX SHEAR IN BOTTOM ELEMENTS OF STEEL SET (BETWEEN
 NODES 35 TO 40 AND NODES 1 TO 6) = $1.119 \times 10^3 \text{ N}$ (ELEM 5)

$$= 0.307 \text{ kips} @ 4' \text{ spacing}$$

FRICTION FORCE AT BOTTOM OF STEEL SET FOOT SEGMENT

$$= \mu N ; \mu = 0.3 \text{ BETWEEN CONCRETE \& STEEL (REF 5.17, P. 275)}$$

$$= 0.3 \times 2.561 \text{ k} = 0.769 \text{ k} > 0.307 \text{ (Max Shear)}$$

\Rightarrow O.K.

\Rightarrow NO SLIDING @ STATION TCW 7+00 (W6 SET @ 4'0")

OVERALL FACTOR OF SLIDING = $\frac{\text{FRICTION FORCE}}{\text{RESISTANCE MAX SHEAR}}$

$$F.S.R. = \frac{0.769}{0.307} = 2.51$$

ALL OTHER STATIONS ALONG THE MAIN DRIFT USING W6x20
 STEEL SETS ARE SUMMARIZED IN PAGE III-108. ALL FRICTION FORCES
 ARE LARGER THAN THE SHEAR IN THE FOOT SEGMENT.
 NO ANCHORAGE IS REQUIRED. THE LOWEST FACTOR OF SLIDING
 RESISTANCE FOR THE W6x20 STEEL SETS IS 2.51 (M07_K2).
 THIS IS A VERY CONSERVATIVE FACTOR BASED ON STANDARD
 ENGINEERING PRACTICE AND IS THEREFORE REASONABLE.

ATTACHMENT III

DI: BABEE0000-01717-0200-00003 REV 02

TITLE: ESF Ground Support - Structural Steel Analysis

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DETERMINATION OF SLIDING					
STEEL SET / SPACING	W8x31, 4'0" o.c.	W8x31, 2'0" o.c.	W8x31, 4'0" o.c.	W8x31, 2'0" o.c.	W8x31, 4'0" o.c.
FILE	m07k250w.sav	m10k250w.sav	m18k250w.sav	m34k250x.sav	p07k2dy.sav
STATION	TCW @ 7+00	PTN @ 10+00	TSW1 @ 18+00	TSW2 @ 34+00	TCW @ 7+00
LOADING	Static	Static	Static	Static	Seismic+Static
Axial sum (N/1 m spacing)	2.360E+06	2.780E+07	1.153E+07	1.999E+07	6.355E+06
Axial ave (N/1 m spacing)	4.918E+04	5.791E+05	2.402E+05	4.165E+05	1.324E+05
Axial ave (kips/spacing)	1.348E+01	7.936E+01	6.583E+01	5.707E+01	3.629E+01
Controlling shear, N	4.972E+03	9.315E+03	1.187E+04	1.222E+04	7.011E+03
Controlling shear, kips	1.363E+00	2.553E+00	3.253E+00	3.348E+00	1.922E+00
Friction force (kips)	4.043E+00	2.381E+01	1.975E+01	1.712E+01	1.089E+01
Result (friction>shear)	O.K.	O.K.	O.K.	O.K.	O.K.
Overall F.S.R.	2.97	9.33	6.07	5.11	5.67

Overall Summary: There is no sliding at any of the above stations.

Axial and shear forces at each station are from Attachment II.

Controlling shear refers to the maximum shear in the lower elements of the steel set.

Calculations for this analysis are obtained by the process outlined on pages III-105 and III-106.

DETERMINATION OF SLIDING			
STEEL SET / SPACING	W8x31, 2'0" o.c.	W8x31, 4'0" o.c.	W8x31, 2'0" o.c.
FILE	p10k2dy.sav	p18k2dy.sav	p34k2dyx.sav
STATION	PTN @ 10+00	TSW1 @ 18+00	TSW2 @ 34+00
LOADING	Seismic+Static	Seismic+Static	Seismic+Static
Axial sum (N/1 m spacing)	4.265E+07	1.776E+07	2.737E+07
Axial ave (N/1 m spacing)	8.886E+05	3.701E+05	5.702E+05
Axial ave (kips/spacing)	1.218E+02	1.014E+02	7.814E+01
Controlling shear, N	1.206E+04	1.497E+04	1.568E+04
Controlling shear, kips	3.305E+00	4.103E+00	4.296E+00
Friction force (kips)	3.653E+01	3.043E+01	2.344E+01
Result (friction>shear)	O.K.	O.K.	O.K.
Overall F.S.R.	11.05	7.42	5.46

Overall Summary: There is no sliding at any of the above stations.

Axial and shear forces at each station are from Attachment II.

Controlling shear refers to the maximum shear in the lower elements of the steel set.

Calculations for this analysis are obtained by the process outlined on pages III-105 and III-106.

ATTACHMENT III

DI: BABEE0000-01717-0200-00003 REV 02

TITLE: ESF Ground Support - Structural Steel Analysis

Page III-109 of III-124

DETERMINATION OF SLIDING					
STEEL SET / SPACING	W6x20, 4'0" o.c.	W6x20, 4'0" o.c.	W6x20, 4'0" o.c.	W6x20, 4'0" o.c.	W6x20, 4'0" o.c.
FILE	m07_k2.sav	m18_k2.sav	m27_k2.sav	m34_k2.sav	m53_k2.sav
STATION	TCW @ 7+00	TSW1 @ 18+00	TSW2 @ 27+00	TSW2 @ 34+00	TSW2 @ 53+00
LOADING	Static	Static	Static	Static	Static
Axial sum (N/1 m spacing)	4.491E+05	3.141E+06	1.764E+06	2.286E+06	1.861E+06
Axial ave (N/1 m spacing)	9.357E+03	6.544E+04	3.675E+04	4.762E+04	3.877E+04
Axial ave (kips/spacing)	2.564E+00	1.793E+01	1.007E+01	1.305E+01	1.063E+01
Controlling shear, N	1.119E+03	4.490E+03	3.538E+03	2.929E+03	3.398E+03
Controlling shear, kips	3.067E-01	1.231E+00	9.697E-01	8.028E-01	9.313E-01
Friction force (kips)	7.693E-01	5.380E+00	3.022E+00	3.915E+00	3.188E+00
Result (friction>shear)	O.K.	O.K.	O.K.	O.K.	O.K.
Overall F.S.R.	2.51	4.37	3.12	4.88	3.42

Overall Summary: There is no sliding at any of the above stations.

Axial and shear forces at each station are from Attachment II.

Controlling shear refers to the maximum shear in the lower elements of the steel set.

Calculations for this analysis are obtained by the process outlined on pages III-105 and III-106.

DETERMINATION OF SLIDING					
STEEL SET / SPACING	W6x20, 4'0" o.c.	W6x20, 4'0" o.c.	W6x20, 4'0" o.c.	W6x20, 4'0" o.c.	W6x20, 4'0" o.c.
FILE	m07_k2dy.sav	m18_k2dy.sav	m27_k2dy.sav	m34c2k2d.sav	m53_k2dy.sav
STATION	TCW @ 7+00	TSW1 @ 18+00	TSW2 @ 27+00	TSW2 @ 34+00	TSW2 @ 53+00
LOADING	Seismic+Static	Seismic+Static	Seismic+Static	Seismic+Static	Seismic+Static
Axial sum (N/1 m spacing)	1.675E+06	5.270E+06	3.166E+06	5.029E+06	3.274E+06
Axial ave (N/1 m spacing)	3.489E+04	1.098E+05	6.596E+04	1.048E+05	6.821E+04
Axial ave (kips/spacing)	9.562E+00	3.009E+01	1.808E+01	2.872E+01	1.870E+01
Controlling shear, N	1.576E+03	6.242E+03	4.392E+03	1.045E+04	4.199E+03
Controlling shear, kips	4.319E-01	1.711E+00	1.204E+00	2.864E+00	1.151E+00
Friction force (kips)	2.869E+00	9.027E+00	5.423E+00	8.615E+00	5.609E+00
Result (friction>shear)	O.K.	O.K.	O.K.	O.K.	O.K.
Overall F.S.R.	6.64	5.28	4.51	3.01	4.87

Overall Summary: There is no sliding at any of the above stations.

Axial and shear forces at each station are from Attachment II.

Controlling shear refers to the maximum shear in the lower elements of the steel set.

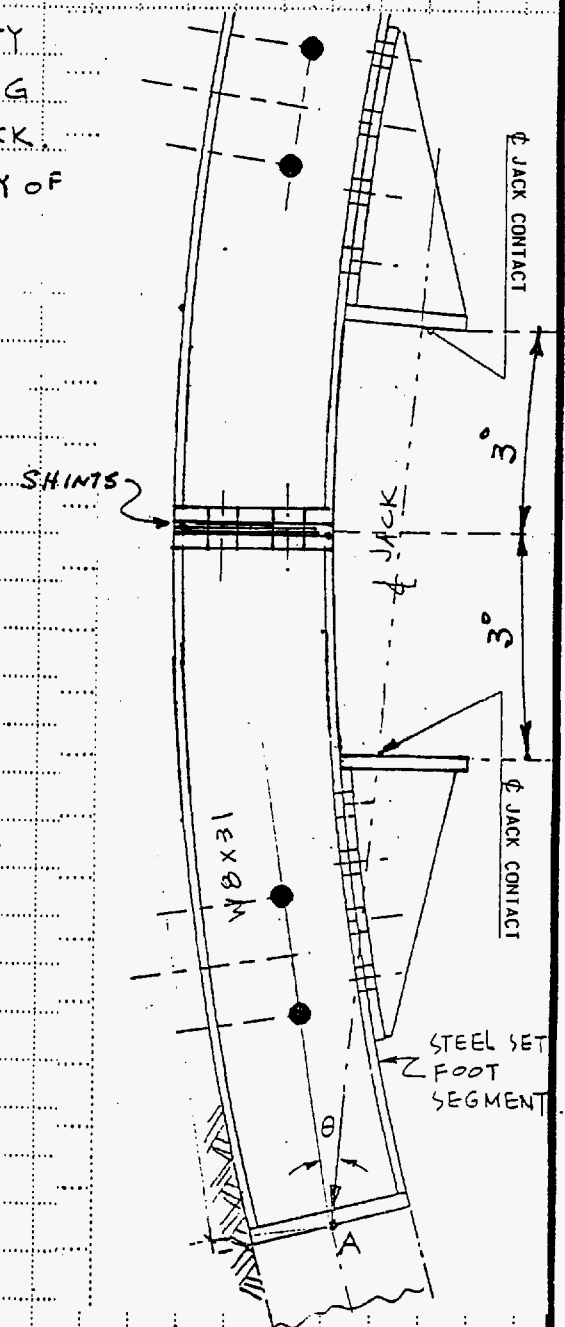
Calculations for this analysis are obtained by the process outlined on pages III-105 and III-106.

PURPOSE III. H

 JACKING CONDITION DURING STEEL SET INSTALLATION :

(ALTERNATE I ONLY, SEE ATTACHMENT IX-5)

THE STEEL SET FOOT SEGMENT DETAIL IS SHOWN ON THE RIGHT. THE STABILITY OF THE FOOT SEGMENT DURING JACKING DEPENDS ON THE POSITION OF THE JACK. AN ANALYSIS TO DETERMINE STABILITY OF THE FOOT SEGMENT IS SHOWN ON THE FOLLOWING PAGES.



STABILITY DETERMINATION OF THE STEEL SET FOOT SEGMENT
AT JACKING LOCATION: W8x31 STEEL SET.

WITH JACKING BRACKETS LOCATED AS SHOWN ON THE
 "STEEL SET DIMENSIONS" SKETCH, FOLLOWING SHEET,
 DETERMINE THE LOCATION OF INTERSECTION OF THE
 LINE OF JACKING FORCE AND THE BASE PLATE.
 IF THIS LOCATION FALLS TO THE LEFT OF $\frac{1}{3}$ SECTION
 OF THE BASE PLATE, STEEL SET AT JACK LOCATION
 WILL BE STABLE DURING THE JACKING OPERATION.
 SEE DETAIL 1 FOLLOWING PAGES.

IN DET. 1:

$$R = \text{RADIUS TO } \phi \text{ STEEL SET} = 12' - 5" - 4" = 12' - 1" = 145"$$

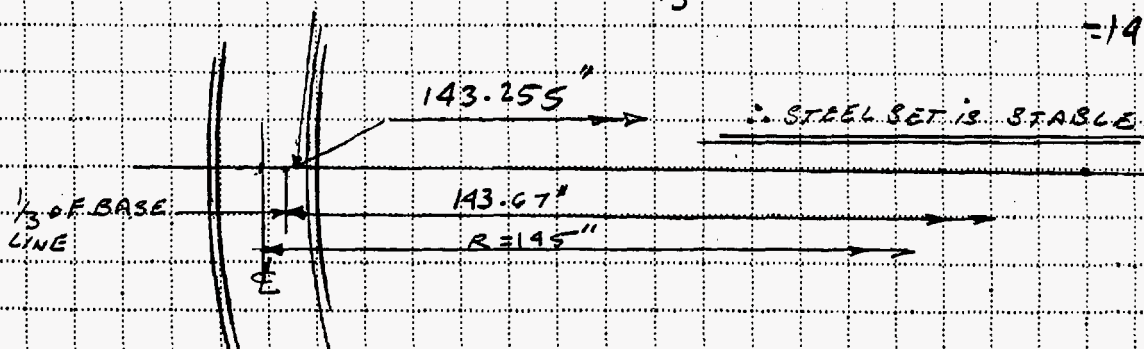
θ = ANGLE BTWN TOP OF LOWER JACK BRACKET & BASE

$$\theta = 17^\circ - 3^\circ = 14^\circ \quad \cos 14^\circ = 0.9703$$

$$\cos \theta = \frac{R - (4" + 2")}{D} = \frac{145 - 6}{D} = 0.9703$$

$$D = 143.255" = \text{DISTANCE BTWN. CENTER OF STEEL SET TO LINE OF JACKING FORCE ON THE BASE PLATE}$$

$$\phi \text{ STEEL SET CIRCLE TO } \frac{1}{3} \text{ OF BASE PLATE} = 145' - 1.33' = 143.67"$$



\therefore STEEL SET IS STABLE.

DETERMINE STABILITY RATIO

$\Delta \theta = 17^\circ - 3^\circ = 14^\circ$ (SEE DET. 1) SKETCH

$\Delta(OB) : \theta = 14^\circ ; \bar{OB} = (145 - 143.255) = 1.745'$

$\bar{B}\bar{X} = \bar{OB} \div \sin \theta = 1.745 \div 0.242 = 7.213 \text{ in}$

$\bar{Y}\bar{B} = \tan 14(145 - 6) = 34.66 \text{ in}$

$\bar{Y}\bar{X} = 7.213 + 34.66 = 41.873 \text{ in}$

$\bar{O}\bar{X} = \frac{\bar{OB}}{\tan \theta} = \frac{1.745}{0.2493} = 7.00$

$\frac{\bar{Y}\bar{X}}{\bar{B}\bar{X}} = \frac{H_{PH}}{\sigma_X} ; H_{PH} = \frac{7 \times 41.873}{7.213} = 40.636$

$H_{PV} = \bar{Y}\bar{X} \sin \theta = 41.873 \times 0.2419 = 10.13 \text{ in}$

RESOLVE JACKING FORCES P INTO P_H & P_V ;

$P_H = P \sin 14^\circ = 0.219 P$

$P_V = P \cos 14^\circ = 0.97 P$

SUPERIMPOSE P_V & P_H TO POINT O' ON BASE:

$M_{PV} = P_V \times H_{PV} = 10.13 P_V ; M_{PH} = P_H \times H_{PH} = 40.636 \times P_H$
 $= 10.13(0.97P) = 9.83 P \quad = 40.636 \times 0.219 P = 8.90 P$

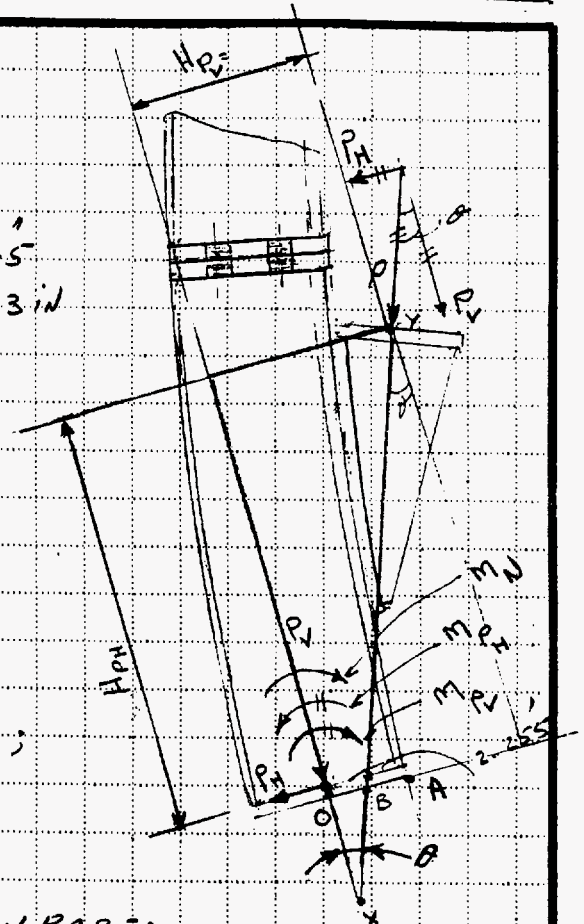
$OTM = 9.83 P - 8.90 P = 0.93 P$

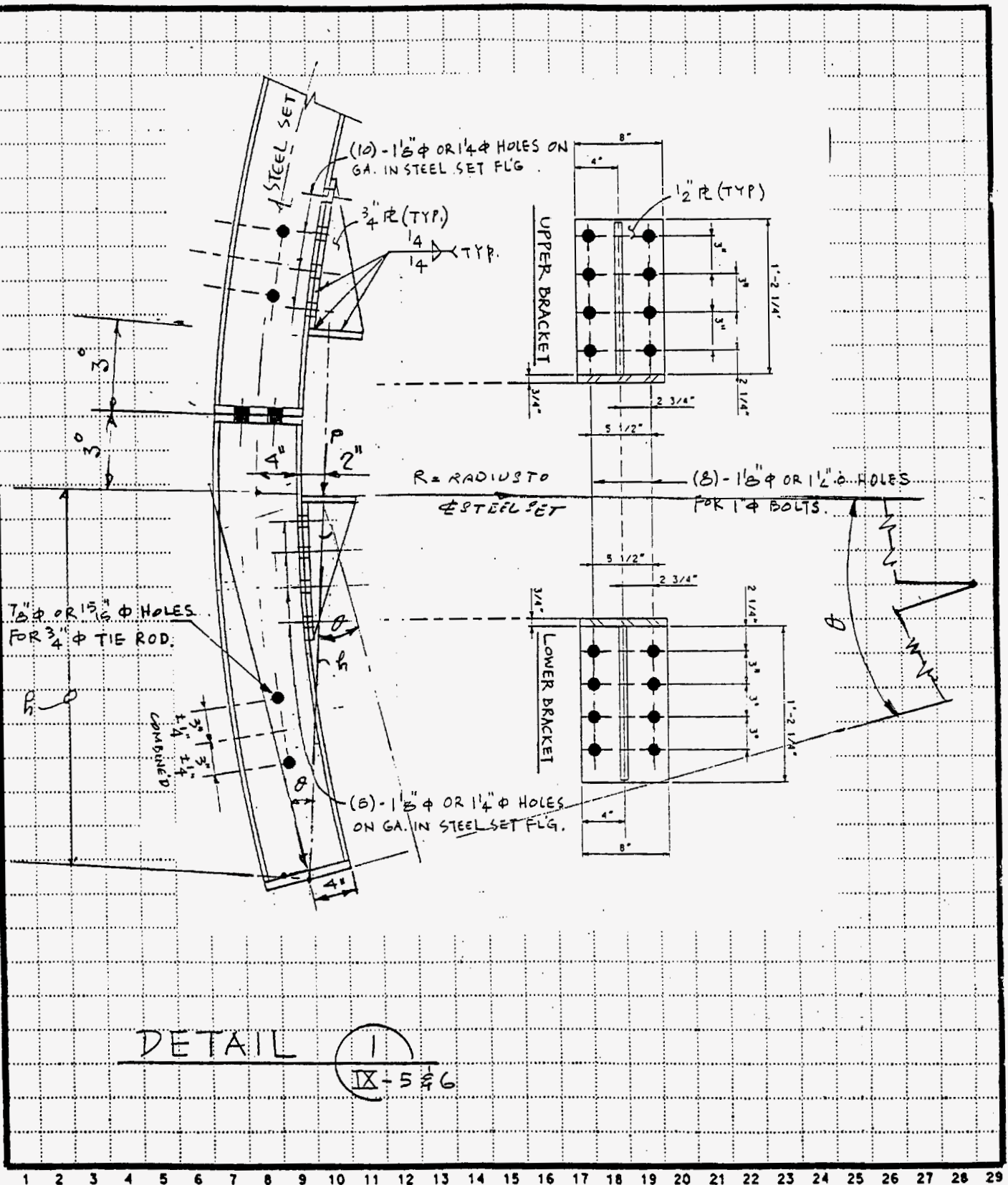
STABILITY MOMENT ABOUT TOE (POINT A) = $P_V \times 4 = 0.97 P \times 4 = 3.88 P$

STABILITY RATIO = $\frac{3.88 P}{0.93 P} = 4.17 > 1.0$ STABILITY RATIO O.K.

CHECK SLIDING: $P_H = 0.219 P$

FRICTION AT BASE = $\mu N = 0.3 P > 0.219 P \therefore$ SLIDING O.K.





STABILITY DETERMINATION OF THE STEEL SET AT JACKING

LOCATION: W6X20 STEEL SET.

FOR REFERENCE OF THIS ENGINEERING CALCULATIONS SEE
STABILITY CALCULATIONS FOR W8X31 STEEL SETS;

$$R = \text{RADIUS TO } \phi \text{ STEEL SET} = 12' - 5" - 3" = 12 - 2" = 146"$$

 θ = ANGLE BTWN TOP OF LOWER JACK BRACKET & BASE PLATE.

$$\theta = 17^\circ - 3' = 14^\circ ; \cos 14^\circ = 0.9703$$

D = DISTANCE BTWN. CENTER OF STL SET
TO LINE OF JACKING FORCE ON THE
BASE PLATE.

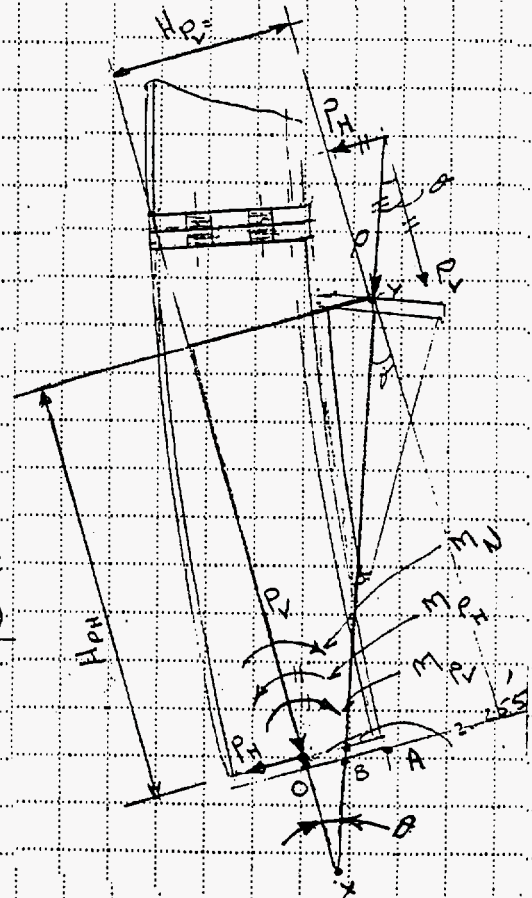
$$\cos \theta = \frac{R - (3" + 2")}{D} = \frac{145" - 5"}{D} = 0.9703$$

$$D = 145 - \frac{5}{3} = 144 \text{ IN}$$

 ϕ STEEL SET TO $\frac{1}{3}$ OF BASE PLATE

$$= 145 - 3" + \frac{6}{3} = 144 \text{ IN}$$

\therefore LINE OF JACKING IS TO
THE LEFT OF $\frac{1}{3}$ OF BASE PLATE LINE
 \therefore STEEL SET FOR W6X20 SECTION
IS STABLE.



DETERMINE STABILITY RATIO FOR W6x20 STEEL SECTION

$$\Delta(0.3x) = 14^\circ \quad \bar{OB} = (146 - 145.32) = 0.68 \text{ in}$$

$$\bar{B}_x = \frac{OB}{\sin \theta} = \frac{0.68}{0.242} = 2.81 \text{ in}$$

$$\bar{Y}_B = \tan 14(146.5) = 35.155 \text{ in}$$

$$\bar{Y}_x = 2.81 + 35.155 = 37.965$$

$$\bar{O}_x = \frac{OB}{\tan \theta} = \frac{0.68}{0.2493} = 2.73 \text{ in}$$

$$\frac{\bar{Y}_x}{\bar{O}_x} = \frac{H_{PH}}{O_x} \quad ; \quad H_{PH} = \frac{2.73 \times 37.965}{2.81} = 36.88 \text{ in}$$

$$H_{PV} = \bar{Y}_x \sin \theta = 37.965 \times 0.2419 = 10.13 \text{ in}$$

RESOLVE JACKING FORCE P INTO P_H & P_V

$$P_H = P \sin 14^\circ = 0.2419 P$$

$$P_V = P \cos 14^\circ = 0.97 P$$

SUPERIMPOSE P_V & P_H TO POINT 'O' ON THE BASE PLATE:

$$M_{PV} = P_V \times H_{PV} = 10.13 \times 0.97 P = 9.83 P$$

$$M_{PH} = P_H \times H_{PH} = 36.88 \times 0.241 = 10.73 P$$

$$OTM = 10.73 P - 9.83 P = 0.90 P \quad \therefore \text{OTM IS IN DIRECTION}$$

$$\text{AGAINST THE TUNNEL WALL} + P_V \times 3'' = 0.97 P \times 3'' = 2.91 P$$

$$\text{IN ADDITION STABILITY MOMENT} = P_V \times 3' = 0.97 \times 3 \times P = 2.91 P$$

\therefore STEEL SET IS PUSHED AGAINST WALL DURING JACKING

(PURPOSE III.I AND III.J NOT USED)

PURPOSE: A) SHIM PLATE CALCULATION FOR WBX31 STEEL SETS

MOST CRITICAL LOADING CONDITION FROM COMPUTER OUTPUT:

STATIC LOADING - STATION 10+00 STEEL SET AT 2'-0" SPACING
MEMBER # 39:

$$SHEAR = -10.49 \text{ KN} \quad AXIAL = 548.8 \text{ KN} \quad MOMENT = 5.01 \text{ KNM}$$

$$\therefore V = 10.49 \text{ KN} \times 0.225 \frac{\text{K}}{\text{KN}} \times 0.61 = 1.44 \text{ K}$$

$$P = 548.8 \text{ KN} \times 0.225 \frac{\text{K}}{\text{KN}} \times 0.61 = 75.26 \text{ K}$$

$$M = 5.01 \text{ KNM} \times 0.738 \frac{\text{KFT}}{\text{KN}} \times 0.61 = 2.26 \text{ K'}$$

* COMPUTER RUN IS BASED ON TRIBUTARY WIDTH OF 1.0 METER, WHILE STEEL SETS ARE TO BE PLACED AT 2'-0" $\therefore 2.0' \div 3.28' = 0.61$ LOAD FACTOR.

$$CONTACT AREA OF THE END PLATE = A_c = 8 \times 8 = 64 \text{ in}^2$$

$$I = \text{MOMENT OF INERTIA OF THE PLATE} = \frac{8(8)^3}{12} = 341.33 \text{ in}^4$$

$$c = 4 \quad ; \quad \frac{M_c}{I} = \frac{2.26(12)(4)}{341.33} = 0.318 \text{ ksi}$$

$$\frac{P}{A_c} = \frac{75.26}{64} = 1.18 \text{ ksi}$$

$$P = \text{MAXIMUM BEARING ON END PLATE} = \frac{P}{A_c} \pm \frac{M_c}{I}$$

$$P = 1.18 \pm 0.318 = \begin{cases} 1.498 \approx 1.5 \text{ ksi} \\ 0.862 \end{cases}$$

PURPOSE III.K A) SHIM PLATE CALCULATION FOR WBX31 STEEL SETS

LOADS:

P = MAXIMUM BEARING PRESSURE
ON END PLATE = 1.5 KSI

P_s = MAX. BEG ON SHIM PLATE
= 1.5 KSI $\frac{\text{AREA END PLATE}}{\text{AREA SHIM PLATE}}$

AREA OF SLOTS = A_{SL}

$$A_{SL} = 2 \times \left[(6.25 - \frac{1.25}{2}) \times 1.25 + \frac{1}{2} (\pi \times \frac{1.25^2}{4}) \right] = 15.28 \text{ in}^2$$

AREA OF SHIM PLATE = A_s

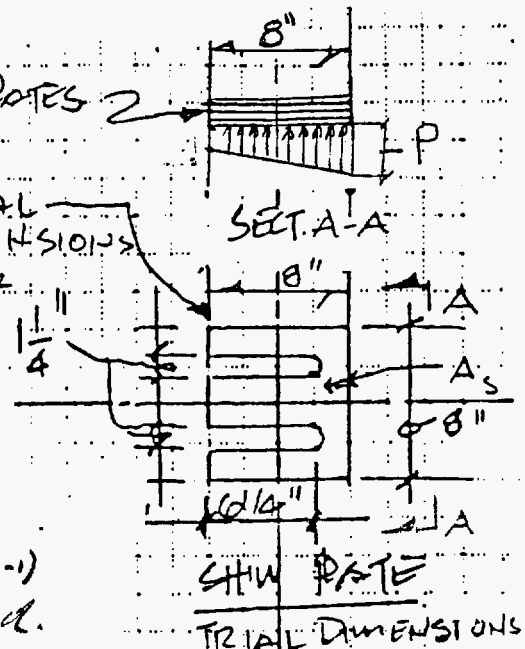
$$A_s = 64 \text{ in}^2 - 15.28 = 48.72 \text{ in}^2$$

$$P_s = 1.5 \text{ KSI} \times \frac{64}{48.72} = 1.97 \text{ KSI}$$

$$\text{ALLOW. BEARING} = 0.9 \times 36 \text{ KSI (AISC. J8-1)} \\ = 32.4 \text{ KSI} >> 1.97 \text{ KSI} \quad \text{OK}$$

SHIM RATES 2

TRIAL DIMENSIONS



SHIM RATES IS OK FOR MAXIMUM PRESSURE

NOTES:

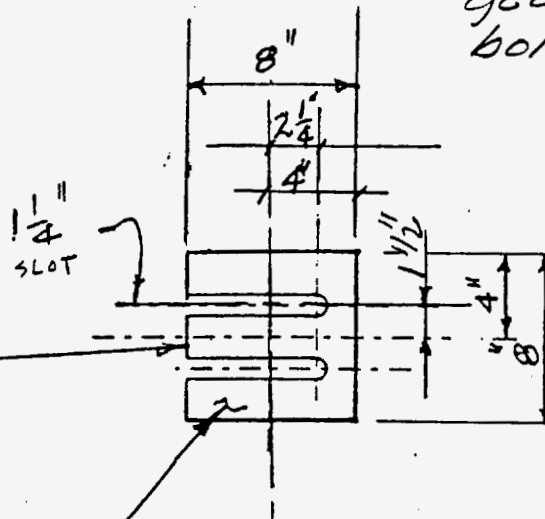
SHIM PLATES PACK RECOMMENDED

1/8" - PLATE
1/2" - "
1/2" - "
1" - "

TOTAL THICKNESS OF THE
SHIM RATES PACK WILL BE CONTRACTOR'S
OPTION AND WILL BE BASED ON THE
INSERT HEIGHT.

SUMMARY

PURPOSE III.K A)

*Shim plate design
is based on the
geometry of the
bolted connections.*

SHIM PLATE PACK

2 EA. 1/8" PLATE

2 EA. 1/4" PLATE

2 EA 1/2" PLATE

1 1" PLATE

CONSTRUCTOR
OPTION.

PLATES ASTM - A 36 (MINIMUM)

SHIM PLATES

PURPOSE IS B) SHIM PLATE CALCULATION FOR W6X20 STEEL SET.

MOST CRITICAL LOADING CONDITION FROM COMPUTER OUTPUT:

STATION 27+00 ; STATIC LOADING ; NODE 39 ;

SHEAR 1776 N ; AXIAL 55460 N ; MOM 425.3 N.M

COMPUTER OUTPUT IS BASED ON 1 METER SPACING WHILE STEEL SETS ARE SPACED AT 4'-0"

$$\frac{4'-0"}{3.28} = 1.22 \Rightarrow \text{FACTOR LOADS}$$

$$1 \text{ KIP} = 0.225 \text{ KN} ; 1 \text{ KIP FT} = 0.738 \text{ KNM}$$

$$V = 1.776 \text{ KN} \times 0.225 \times 1.22 = 0.49 \text{ K}$$

$$P = 55.46 \text{ KN} \times 0.225 \times 1.22 = 15.22 \text{ K}$$

$$M = 0.425 \text{ KNM} \times 0.738 = 0.38 \text{ K}$$

$$P = \text{PRESSURE ON END PLATE} = \frac{P}{A_c} \pm \frac{Mc}{I}$$

$$A_c = 6.25'' \times 7.0'' = 43.75 \text{ in}^2 ; c = 7'' \div 2 = 3.5''$$

$$I = \frac{1}{12} \times 7.5 (6.25)^3 = 152.59 \text{ in}^4$$

$$P = \frac{15.22 \text{ K}}{43.75} \pm \frac{0.38 \times 12 \times 3.5}{152.59} = 0.348 \pm 0.105 = \begin{cases} 0.243 \text{ KSI} \\ 0.453 \text{ KSI} \end{cases}$$

PURPOSE III, K (B) SHIM PLATE CALCULATION FOR
W16X20 STEEL BEAMS.

LOADS: P_1 (FROM PREVIOUS MEET)

$P_1 = 0.453 \text{ ksi} = \text{MAXIMUM BEARING PRESSURE ON}$
 $6.25" \times 7.0" \text{ END PLATE} = 43.75 \text{ IN}^2$

AREA OF THE SHIM PLATE = 43.75 IN^2 - AREA OF THE
 SLOT.

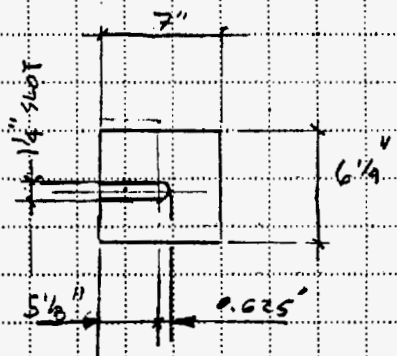
AREA OF THE SLOT = A_s

$$A_s = 2 \times \left[1.25 \times 3.125 + (.5 \times \pi \times .625^2) \right]$$

$$= 2 (3.906 + 0.613) = 9.04 \text{ IN}^2$$

$$\text{AREA SHIM PLATE} = 43.75 - 9.04$$

$$= 34.71 \text{ IN}^2$$



MAXIMUM BEARING PRESSURE ON THE SHIM PLATE
 $= P_1 \times \frac{\text{AREA END PLATE}}{\text{AREA OF SHIM PLATE}} = \frac{43.75}{34.71} \times 0.453 = 0.571 \text{ ksi}$
 $0.571 \text{ ksi} < \text{ALLOWED BEARING PRESSURE FOR STEEL}$

2. SHIM PLATES d_s FOR
BEARING PRESSURE
 USE $6 \frac{1}{4} \times 7" \text{ PLATES - ASTM}$
 A-36, MINIMUM.

Purpose III.L Steel Wedges

Wedges and blocking are installed behind the steel set as required to ensure that the steel set is in positive contact with the excavated surface. (See Section 2.3)

Wedge and blocking material can be of wood or metal. A typical steel wedge made from plate or tubing is shown on p. III-124.

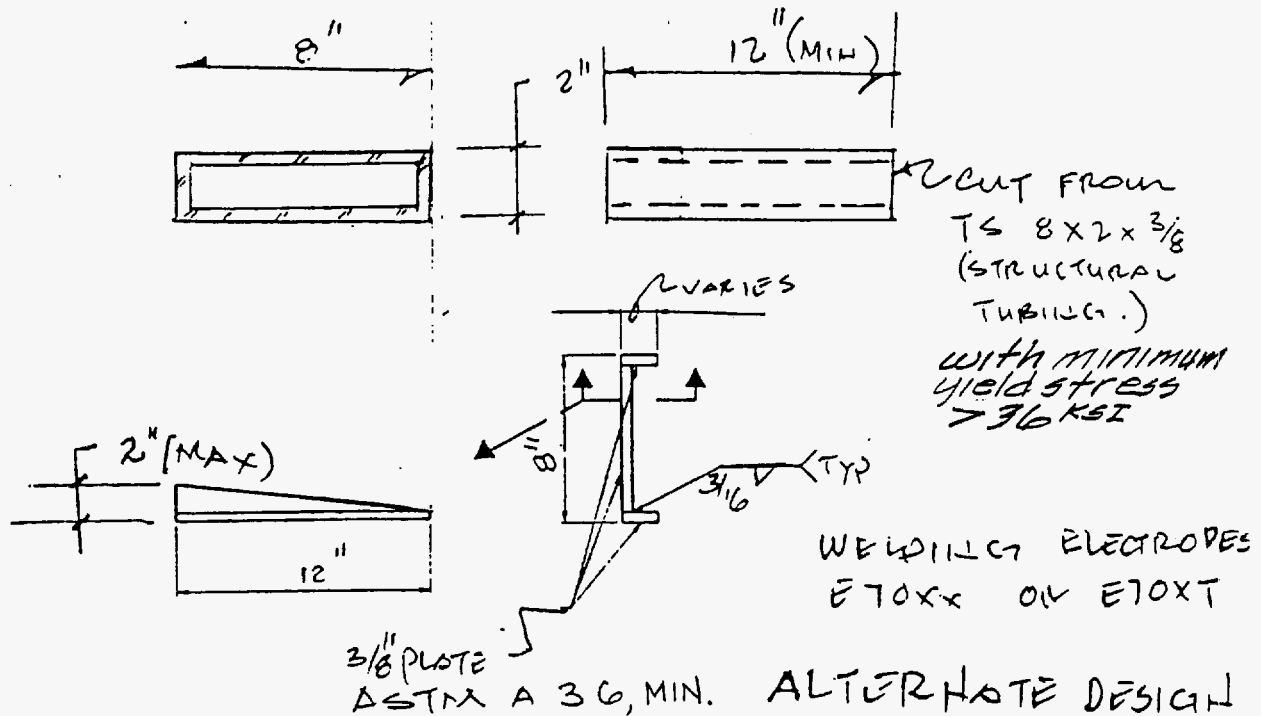
Other suggested options are shown in Attachment IX, p. IX-14. Alternate designs by the Constructor are subject to A/E approval.

Crushing of the wedge material may occur during rock loading, however positive contact between the excavated surface and the steel set will remain. Numerical analysis of the wedge is not required.

Blocking, backfill or other materials placed in voids shall be selected by the Constructor and are subject to A/E approval.

(NOT USED)

Summary



STEEL WEDGES
Structural Tubing or
Plate shown

ALTERHATE DESIGN
BY CONSTRUCTOR
SHALL BE REVIEWED
BY A/E.

IMPACT REVIEW ACTION NOTICE

CRWMS/M&O

Complete only applicable items.

Page: 1 Of: 1

Date _____

Attachment 1.0

Impact Review Action Notice for Letter: Sandia National Laboratories, Joe Grant to John Pye, Strain Gage Data Results, Plots of Stress versus Time

6. Results of Impact Review

The document identified in Block 5, transmits preliminary unchecked Stress versus Time Plots based on strain gage data for 28 steel sets installed in the ESF. Review of these stress/time plots indicates that steel stresses at the gages generally range from -12,500 psi (tension) to 11,000 psi (compression) with three major stress deviations ranging from -24,000 psi to 30,000 psi.

Two of the stress deviations are in steel set #158, station 2+50, at stress values of 20,000 psi and 30,000 psi and are based on data from gages identified as defective in February 1995, and are therefore not valid. The other stress deviation is in steel set #189, station 3+48, at a stress value of -24,000 psi. This stress deviation is assumed to be from a valid gage reading for this review. A gage reading opposite this deviation is -4,000 psi for set #189, and does not reflect a similar high stress value. This stress deviation may be the result of an eccentrically loaded flange or the result of a faulty gage.

Using the stress deviation above for set #189, the following axial and bending stresses were developed:

Steel Set #189

Axial Stress = -8333 psi

Bending Stress = 11160 psi

Combined axial tension and bending stresses are proportioned to 0.91 which is less than 1.0 and is in accordance with AISC requirements.

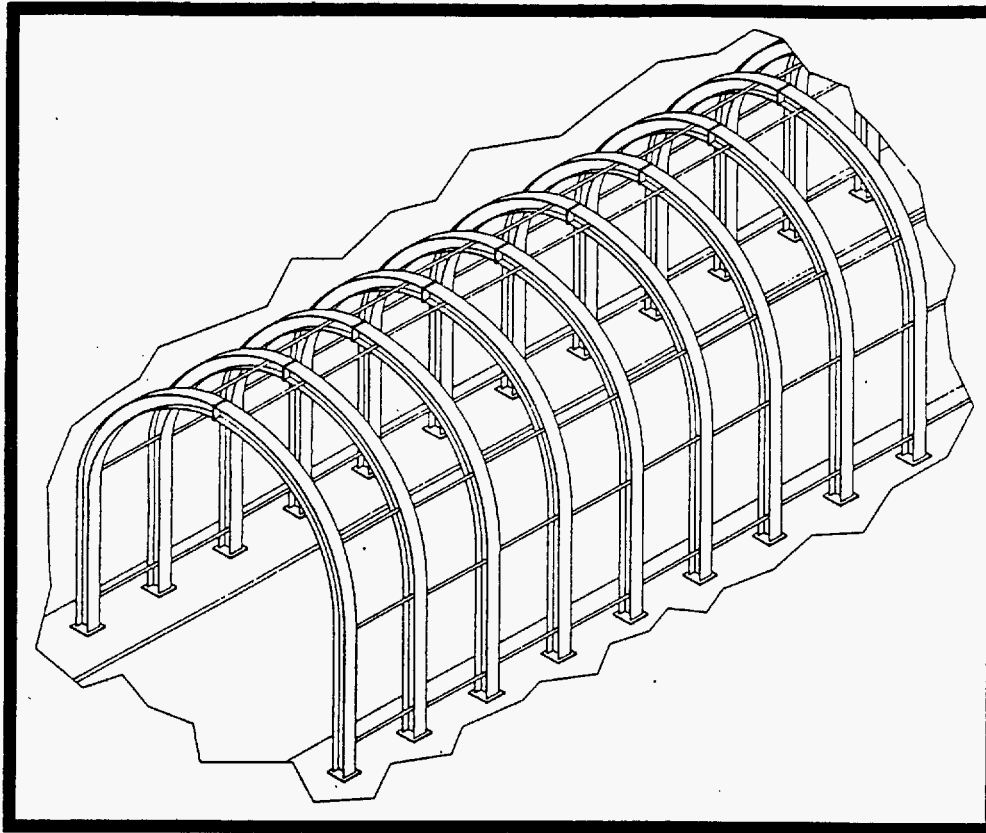
The major stress deviation analyzed is within AISC requirements. The general range of gaged steel stress, -12,500 psi to 11,000 psi, will therefore be within AISC requirements.

Strain gage data and stress/time plots are preliminary and are being checked. A final report on strain gage data and stress/time plots is expected within three weeks and an impact review will be made. No further impact reviews will be made on preliminary and unchecked strain gage data and related reports.

In conclusion, there are no impacts on design products based on data reviewed.

ATTACHMENT V

CPS STRUCTURAL STEEL SUPPORTS
CATALOG



STRUCTURAL STEEL SUPPORTS

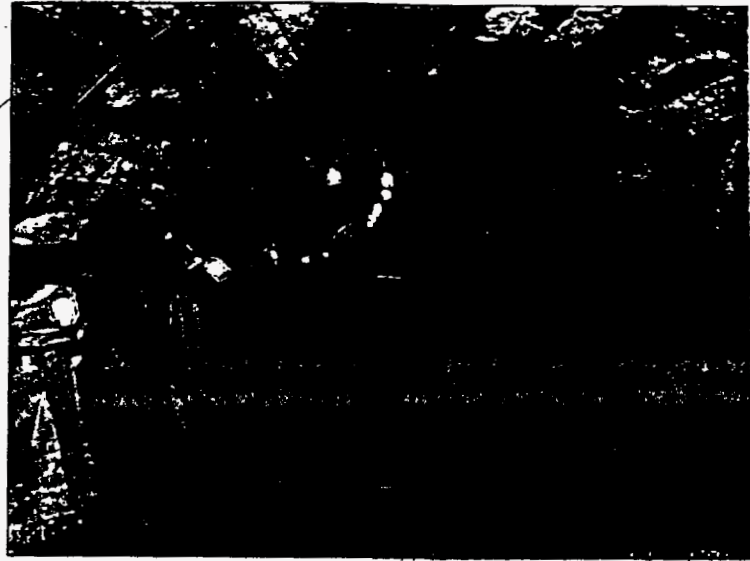


Commercial Pantex Sika, Inc.

TECHNICAL CAPABILITIES FOR STEEL RIBS

Commercial Pantex Sika has cold-rolled beams for underground supports for over 70 years. What we have learned about shaping steel for strength, performance and value in the world's tunnels and mines can be applied to the benefit of your project.

Our abilities to bend I, WF and H sections range from 4" to 27" in depth. We have bent 14" WF at 287 lbs. per foot with 2" thick flanges. Curvatures range from a minimum radius of 10 times the beam depth for 4" and 6" sections to 14 times the depth of section for any greater radius. We are also able to bend more than one radius in a single length if compound arcs are specified. While we have worked with 30 foot sections we recommend they



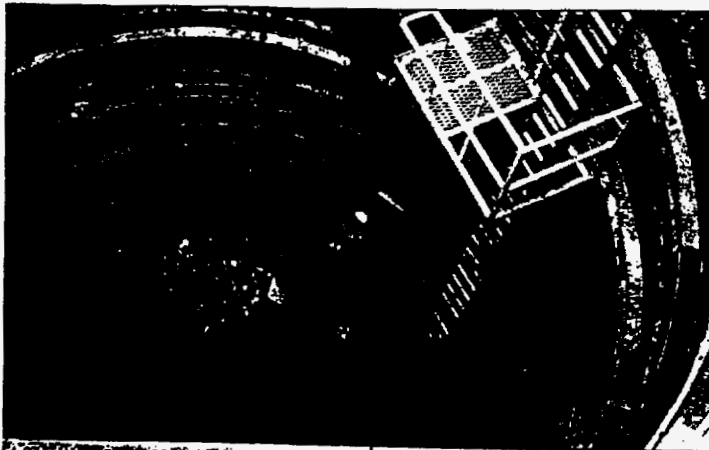
Seven K Construction, Farmers Branch, TX

not exceed 22 to 25 feet. We also recommend against the use of lighter weight per foot sections when the radius of curvature is less than 25 times the depth of section.

All beams are checked to a template after bending. Both ends must conform to the true template and the maximum departure from the template is held to the following tolerances:

Under 20 ft.	+/- 3/8 inch
20 to 25 ft.	+/- 1/2 inch
25 ft. and up	+/- 3/4 inch

Variance is gradual without any abrupt change in curvature, the tolerance approaching maximum at beam center. Referenced to any 3 ft. segment of a curved beam tolerance is held to 1/8". Where necessary to hold curvature even closer, additional la-



Apfholder, Inc., Houston, TX



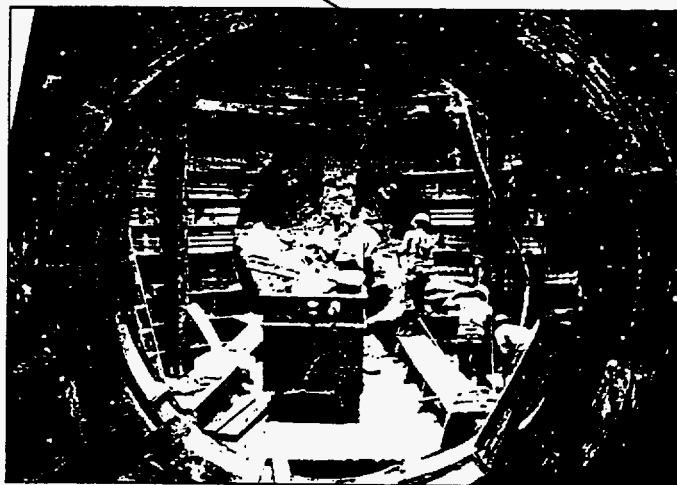
Seven K Construction, Farmers Branch, TX

bor over and above standard procedure can be performed to insure even less variation and tighter tolerances.

The uniformity of the material as-rolled is a factor that affects tolerances. The closer the profile of the as-rolled beams conforms to the cross section the closer and more uniform the tolerances of the finished product will be.

The methods we use do not distort or impair the grain flow of the metal, nor do they reduce the load carrying capacity of the finished section. In fact, certain characteristics such as camber and flange alignment are improved. It has also been our experience that cold working of steel actually increases the as-rolled yield point. Nev-

ertheless, we do not feel that load carrying values of our cold rolled bent beams should be calculated as having greater strength than as-rolled



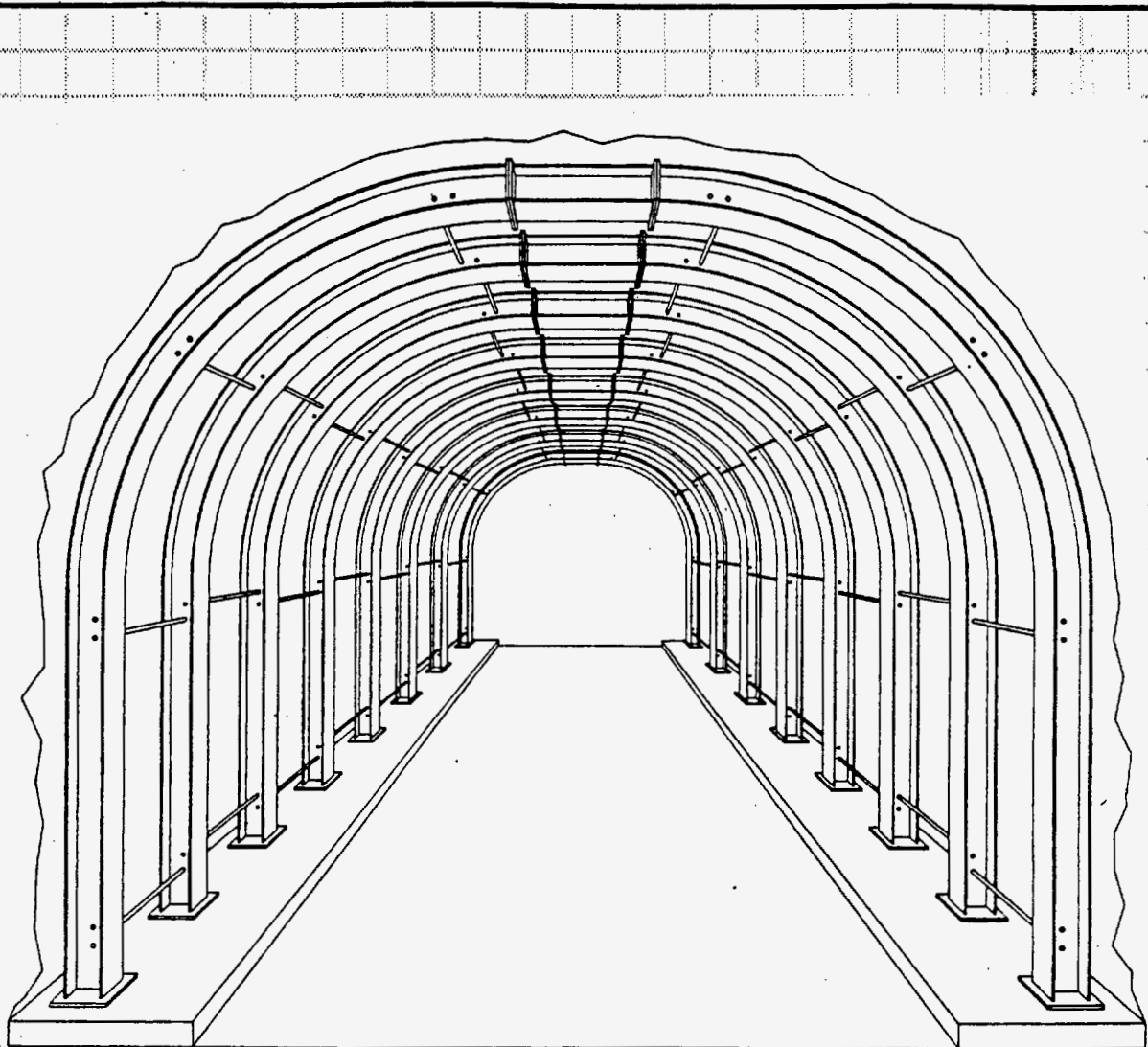
Affholder, Inc., Houston, TX

sections. When curved to a minimum radius some droop may occur to the outer edges of the top flange.

Because every beam necessarily fulfills specific requirements, prices for our work must be quoted for each inquiry. We are prepared to furnish labor and material.

Commercial Pantex Sika is the leading full service supplier of underground support systems and related specialty products in North America. It has been our pleasure to service the North American underground market since 1923. In addition to beams we manufacture liner plates and Pantex design Lattice Girders.

We also fabricate straight beams, forepoling sheets and steel lagging. Contact us for your underground support needs.



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COLD FORMED STEEL BEAMS

We appreciate your interest in our capabilities to bend structural beams cold for use in curved arch support.

Our abilities to bend I, WF and H sections range generally from 4" to 27" in depth. We have bent 14" WF at 287 lbs. per foot with 2" thick flanges. Curvatures range from a minimum radius of 14 times the depth of the section to any greater radius. We're also able to bend more than one radius in a single length of section if compound arcs are specified. While we have worked with 30 foot sections, we recommend they not exceed 22 to 25 feet which, incidentally, is convenient for shipment by truck. We also recommend against the use of lighter (wt./ft.) sections when the radius of curvature is less than 25 times the depth of the section.

All beams are checked to a template after bending. Both ends must conform to the true template and the maximum departure from the true template is held to $\pm 3/8"$ for beams not exceeding 20 feet in length. Tolerance for beams 20 to 25 feet in length are held to $\pm 1/2"$; 25 to 30 feet in length to $\pm 3/4"$. Variance is gradual without any abrupt changes in curvature, the tolerance approaching maximum at beam center. Referenced to any 3' segment of a curved beam, tolerance are held to within $1/8"$. Where necessary to hold curvature even closer, additional labor over and above standard procedure can be performed to insure even less variation.

It becomes obvious that the uniformity of the material as-rolled is a factor that affects tolerances. The closer the profile of the as-rolled beam conforms to the cross section, the closer and more uniform the tolerances of the finished product will be.

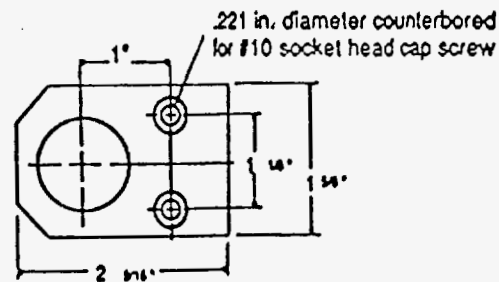
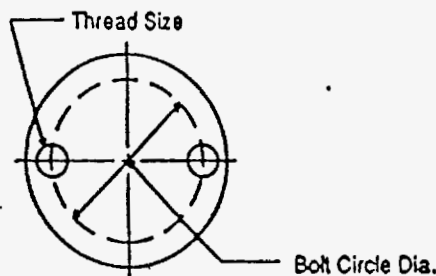
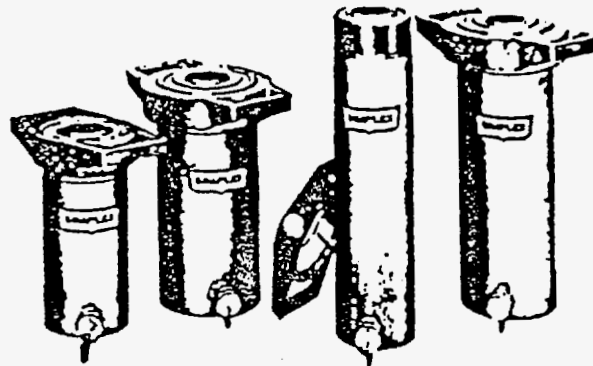
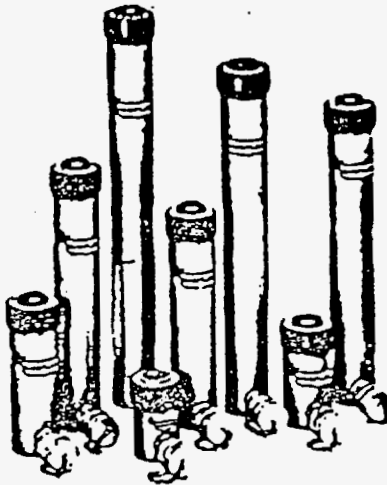
The methods we use do not distort or impair the grain flow of the metal, nor do they reduce the load-carrying capacity of the finished section. In fact, certain characteristics such as camber and flange alignment are improved. Also, it has been our experience that cold working of steel actually increases the as-rolled yield point. Nevertheless, we do not feel that load-carrying values of our cold bent beams should be calculated as having greater strength than as-rolled sections. When curved to minimum radius, some droop may occur to the outer edges of the top flange.

Because every beam necessarily fulfills specific requirements, prices for our work must be quoted for each inquiry. We are prepared to furnish labor and material; consequently we carry structurals with heaviest demand in stock. If the customer prefers to supply material, we will quote labor only. Care should be exercised, however, to insure that all structurals furnished are clean and free from excessive rust and scaling surface.

Although we are the recognized leader in the underground support industry, we are not structural fabricators. Therefore we offer no engineering or technical service for the design, specification or other technical aspects of any above-ground structure.

**ATTACHMENT VI
MISCELLANEOUS REFERENCE DATA**

1. JACKING PERFORMANCE INFORMATION, ORIGINAL SOURCE: TK SIMPLEX CATALOG, HYDRAULIC AND MECHANICAL JACKS FOR INDUSTRY, 1990, SEE PAGES VI-2 THRU VI-6 (FOR INFORMATION ONLY: TYPE HSR-258T & HSR-2510T DIMENSIONAL INFORMATION AS USED IN ATTACHMENTS I & IX, WHICH APPROXIMATES THE 25 TON JACK USED IN CONSTRUCTION OF INITIAL W8x31 STEEL SETS)
2. JACKING PERFORMANCE INFORMATION, NEW SOURCE: SIMPLEX CATALOG NO. SC101, HYDRAULIC AND MECHANICAL POWER, 1995, SEE PAGES VI-7 & VI-8 (FOR INFORMATION ONLY: DIMENSIONAL INFORMATION FOR TYPES R-258 & R-2510 WHICH ARE SAME AS 25 TON JACKS IN ITEM 1, ABOVE. ALSO, AS NOTED IN ATTACHMENT VIII, PAGE VIII-1, ANALYSIS FOR 15 TON JACKING LOAD REQUIRED FOR PROPOSED W6x20 STEEL SETS USED SAME JACKING CONFIGURATION AS USED IN ATTACHMENT I)
3. TELECON RECORD, M. CHEN/M&O WITH AISC ENGINEERING & RESEARCH STAFF, SUBJECT: DEFINITION OF SNUG TIGHT ON BOLTS, 10/03/95.

SIMPLEX®**Spring Return Tooling Cylinders****Mounting Hole Dimensions**

Cylinder	Thread Size	Bolt Circle Diameter (in)
*5 ton	$\frac{1}{4}$ - 20 X $\frac{1}{2}$	1.00
10 ton	$\frac{3}{16}$ - 18 X $\frac{1}{2}$	1.56
15 ton	$\frac{3}{8}$ - 16 X $\frac{3}{4}$	1.87
25 ton	$\frac{1}{2}$ - 16 X $\frac{3}{4}$	2.31
**50 ton	$\frac{1}{2}$ - 13 X $\frac{3}{4}$	3.75

* All 5 ton models except HSR50

** HSR506T & HSR5013T only

HSR 50 Dimensions**Collar & Plunger Threads**

Cylinder	Collar Thread Size	Plunger Thread Size
*5 ton	$1 \frac{1}{2}$ - 16 X $1 \frac{1}{8}$	$\frac{3}{4}$ - 16 X $\frac{5}{8}$
10 ton	$2 \frac{1}{4}$ - 14 X $1 \frac{1}{8}$	**1 - 8 X $\frac{3}{4}$
15 ton	$2 \frac{3}{4}$ - 16 X $1 \frac{1}{8}$	1 - 8 X 1
25 ton	$3 \frac{1}{2}$ - 12 X $1 \frac{1}{8}$	$3 \frac{1}{8}$ - 12 X $1 \frac{1}{8}$
30 ton	$3 \frac{1}{2}$ - 12 X $1 \frac{1}{8}$	$1 \frac{1}{2}$ - 16 X $1 \frac{1}{8}$
50 ton	5 - 12 X 2 $\frac{1}{8}$	*****
75 ton	$5 \frac{3}{4}$ - 12 X $1 \frac{3}{4}$	*****
100 ton	6 $\frac{1}{4}$ - 12 X 2 $\frac{1}{8}$	*****

* None on HSR50

** None on HSR101T

Suggested Tonnage Gauges for HSR Series

Cylinder	Gauge	Gauge Face Diameter (in)
5 ton	1917201	2 $\frac{1}{2}$
10 ton	1917301	2 $\frac{1}{2}$
15 ton	1917401	2 $\frac{1}{2}$
25 ton	1917701	2 $\frac{1}{2}$
30 ton	1915801	3 $\frac{1}{2}$
50 ton	1916301	3 $\frac{1}{2}$
100 ton	1916701	3 $\frac{1}{2}$

For further information on gauges see page 32.

SIMPLEX®**Spring Return Tooling Cylinders****5 to 100 ton HSR-series**

These single-acting, spring return cylinders are an excellent choice for maintenance lifting, machinery positioning, or any of a wide variety of high pressure, heavy duty pressing or tooling operations.

All models except the HSR-50 and HSR-100T have plunger, base and collar threads to ensure application flexibility and are equipped with snap-in removable grooved load caps. The HSR-series cylinders include high-flow, quick disconnect ram half-couplers.

Plated pistons not only resist corrosion, they also provide exceptional bearing surfaces. All collar threads are designed to hold the full rated capacity of the cylinders. Simplex HSR-series cylinders have a 2:1 factor of safety on material yield and are in full compliance with ASME/ANSI B30.1 safety standards.

The Simplex HSR-series cylinders are dimensionally interchangeable with most competitive models.

The HSR506T, HSR5013T, HSR756T, HSR1006T and HSR10010T include removable thread-on handles.

Solid Ram - Spring Return Cylinders

Model Number	Order Number	Capacity (tons)	Stroke (in)	Closed Height (in)	Pressure Capacity (psi)	Reservoir Capacity Required (cu in)	Body Dia. (in)	Effective Area (sq in)	Piston Dia. (in)	Weight (lbs)	Smallest Suggested Hand Pump
HSR-50	13171	5	5.0	1.50	10,060	.8	1.00	.99	1	2.00	34145
HSR-51T	13172		1	4.1100		1.0				2.00	
HSR-53T	13173		3	6.00		3.0				3.00	
HSR-55T	13174		5	8.00		5.0				4.00	
HSR-57T	13175		7	10.00		7.0				5.00	
HSR-58T	13176	10	9.00	12.00	8,945	9.1	2.00	2.24	1.00	5.00	34003
HSR-101T	13177		1	3.1100		2.2				3.00	
HSR-102T	13178		2.00	4.2500		4.8				4.00	
HSR-104T	13179		4.00	8.00		9.2				6.00	
HSR-106T	13180		6.00	9.00		13.7				8.00	
HSR-108T	13181	15	8	11.00	9,554	18.0	2.00	3.14	1.00	10.00	34003
HSR-1010T	13182		10.00	13.00		22.7				12.00	
HSR-1012T	13183		12	15.00		27.0				13.00	
HSR-1014T	13184		14	17.00		31.5				15.00	
HSR-152T	13152		2	5.00		6.3				8.00	
HSR-154T	13153	25	4	7.00	9,700	12.6	3.00	5.15	2.00	10.00	34145
HSR-156T	13154		8	10.00		19.0				14.00	
HSR-1510T	13156		10	14.00		31.4				19.00	
HSR-1512T	13157		12	16.00		37.7				22.00	
HSR-1514T	13158		14	18.00		44.0				24.00	
HSR-251T	13160	50	1	5.00	9,245	5.2	4	6.48	2.00	12	34145
HSR-252T	13161		2	6.00		10.3				15	
HSR-254T	13162		4	8.00		20.6				18	
HSR-256T	13163		6.00	10.00		32.2				23	
HSR-258T	13164		8.00	12.00		42.5				27	
HSR-2510T	13165	75	10.00	14.00	9,430	52.8	5.00	15.90	3.00	31	34003
HSR-2512T	13166		12.00	16.00		63.1				35	
HSR-2514T	13167		14.00	18.00		73.4				39	
HSR-506T	13270		6.00	15.00		53.8				40	
HSR-502T	13271		2	8.1500		22.1				32	
HSR-506T	13273	100	6.00	11.00	9,054	59.0	5	11.05	3.00	50	35102
HSR-5013T	13275		13.00	18.00		146.3				78	
HSR-756T	13276	100	8.00	11.00	9,430	97.4	8.00	20.63	4.00	63	35102
HSR-1006T	13277		8.00	13.00		137.0				80	
HSR-10010T	13278		10.00	18.00	9,695	212.0				110	

Hand pumps are suggested for these units (see pages 19-25).

AS USED IN ATTACHMENTS I & IV FOR W6

AS USED IN ATTACHMENT I & IX FOR W6

SIMPLEX®**VL Jacking Cylinder Tables****VL Plain Piston Cylinders**

Model Number	Order Number	Capacity (tons)	Stroke (in)	Closed Ht. (in)	Reservoir Cap. req. (cu in)	Effective Area (sq in)	Pressure @ Cap. (psi)	Body Diam. (in)	Rod Diam. (in)	Weight (lbs)
CC306	15002	30	6	8.87	38.9	6.49	9,240	4.00	2.88	32
CC3012	15003		12	14.87	77.9					53
CC506	15021	50	6	8.97	66.3	11.05	9,054	5.25	3.75	55
CC5012	15022		12	14.97	133.0					92
CC1006	15041	100	6	10.02	124.0	20.63	9,695	7.19	5.13	115
CC10012	15042		12	16.02	248.0					184
CC1502	15060	150	2	6.50	66.4	33.18	9,041	9.00	6.50	117
CC1506	15061		6	10.50	199.0					189
CC15012	15062		12	16.50	398.0					297
CC2002	15080	200	2	7.50	88.4	44.18	9,054	10.50	7.50	184
CC2006	15081		6	11.50	265.0					282
CC20012	15082		12	17.50	530.0					429
CC3002	15201	300	2	9.00	120.3	60.13	9,978	12.00	8.75	288
CC3006	15202		6	13.00	361.0					405
CC30012	15203		12	19.00	722.0					597
CC5002	15220	500	2	11.50	207.7	103.87	9,628	16.00	11.5	655
CC5006	15221		6	15.50	623.0					855
CC50012	15222		12	21.50	1246.0					1197

VL Lock Nut Cylinders

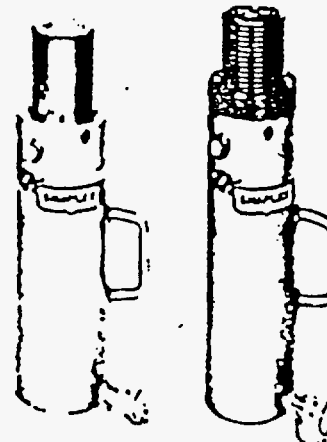
Model Number	Order Number	Cap. (tons)	Stroke (in)	Closed Ht. (in)	Reservoir Cap. Req. (cu in)	Effective Area (sq in)	Pressure @ Cap. (psi)	Body Diam. (in)	Rod Diam. (in)	Lock Nut (in)	Weight (lbs)
CCLN302	15101	30	2	5.87	13.0	6.49	9,240	4.00	2.88	1.00	21
CCLN306	15102		6	9.87	38.9						35
CCLN3012	15103		12	15.87	77.9						57
CCLN502	15120	50	2	6.22	22.1	11.05	9,054	5.25	3.75	1.25	38
CCLN506	15121		6	10.22	66.2						63
CCLN5012	15122		12	16.22	133.0						100
CCLN1002	15140	100	2	7.52	41.3	20.63	9,695	7.19	5.13	1.50	87
CCLN1006	15141		6	11.52	124.0						132
CCLN10012	15142		12	17.52	248.0						202
CCLN1502	15160	150	2	8.25	66.4	33.18	9,041	9.00	6.50	1.75	149
CCLN1506	15161		6	12.25	199.0						221
CCLN15012	15162		12	18.25	398.0						311
CCLN2002	15180	200	2	9.50	88.4	44.18	9,054	10.50	7.50	2.00	233
CCLN2006	15181		6	13.50	265.0						332
CCLN20012	15182		12	19.50	530.0						479
CCLN3002	15401	300	2	11.50	120.3	60.13	9,978	12.00	8.75	2.50	357
CCLN3006	15402		6	15.50	361.0						485
CCLN30012	15403		12	21.50	722.0						677
CCLN5002	15420	500	2	14.75	207.7	103.87	9,628	16.00	11.5	3.25	813
CCLN5006	15421		6	18.75	623.0						1041

SIMPLEX®**VL Jacking Cylinders****Unparalleled Jacking Performance**

These economical, single-acting, load-return cylinders are the perfect choice for use in tight working conditions such as bridge lifting as well as other construction or jacking applications. Simplex VL jacking cylinders offer up to 2" more stroke than conventionally designed single-acting cylinders of equal closed height.

Only Simplex jacking cylinders employ the exclusive Smart Stop™ 3-Way Over-travel Prevention System. First, a red warning ring appears when the piston has reached the limit of its rated stroke. If this warning goes unnoticed when the cylinder is under load, a bleed valve safely vents oil to the atmosphere. Finally, an internal stop ring prevents over-extension of the piston when operating under no load conditions.

VL jacking cylinders are available in a plain piston version, or with threaded pistons and lock nuts. The lock nut version eliminates the need for cribbing loads in applications requiring sustained load holding.



VL plain piston

VL threaded jacking cylinder with lock nut

Other unique Simplex features

- VL jacking cylinders comply with ASME/ANSI B30.1 safety standards.
- Domed piston rods minimize the effect of eccentric and side loading.
- Grease fittings protected against moisture, dirt and corrosion.
- Plated pistons resist corrosion.
- Built-in carrying handles on 30 and 50 ton models.
- Eye bolts for lifting and positioning on 100-500 ton models.
- Specialty designed seals avoid damage when the piston is extended beyond its rated stroke under load.
- Black-oxidized lock nuts resist corrosion.

Economic Hydraulic System Design

Templeton, Kenly & Co.'s patented Retractor Valve allows the practical application of our VL jacking cylinders into systems less costly than traditional high-tonnage jacking systems.

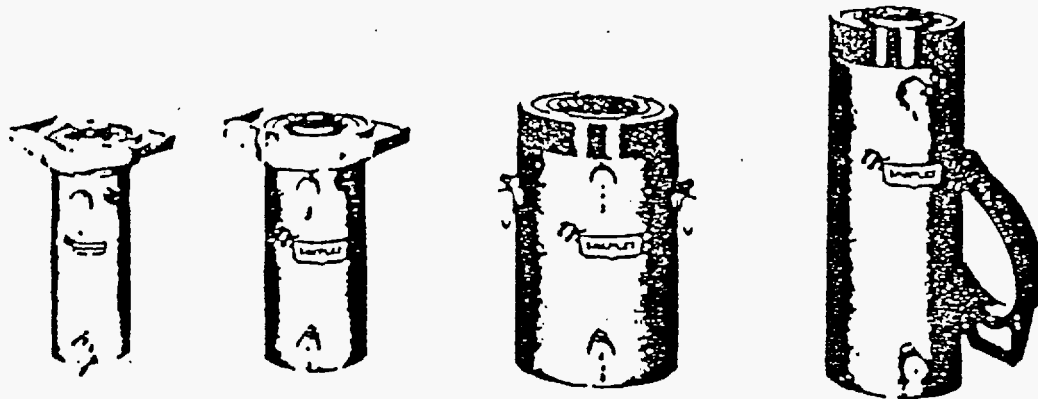
The following price percentage comparison demonstrates this cost savings. Each system includes four (4) 200 ton X 6 inch stroke cylinders. One of the systems utilizes traditional double-acting cylinders with double runs of hose to each cylinder. The other uses the new Simplex single-acting VL Jacking Cylinders and a Retractor Valve equipped pump.

System Component	Traditional Double-Acting System		Simplex System w/VL Jacking Cylinders and Retractor Valve	
	Order #	% of Sys. Cost	Order #	% of Trad. Sys. Cost
Pump: 1.5 HP Perm. Mag. 5 Gallon Reservoir, Manual 3 Pos. Valve.	7100504	12.5	7100513	12.7
Control Manifold:	18086	1.8	18086	1.8
Return Manifold:	1814201	.5	Not Required	0.0
Hoses: Assumes				
• 2 cylinders @ 10' distance	(8) 18204	4.4	(4) 18098	4.0
• 2 cylinders @ 30' distance	(8) 18202	3.7	(4) 18097	3.6
• 1/4" I.D. hose on double-acting	(1) 18164	.3	(8) 18113	.3
• 3/8" I.D. on single-acting.	(16) 18113	.6		
All hoses are 10 foot multiples.				
Check Release Valve:	(4) 18074	4.7	(4) 18074	4.7
Cylinders:	(4) 13233	71.5	(4) 15081	49.9
Total System Cost =		100.0		77.0
Savings with new Simplex VL Jacking Cylinders = 23%				

SIMPLEX®**Double-Acting Solid Ram Cylinders**

Simplex Double-Acting Cylinders should be considered when the application requires fast cylinder retraction and/or frequent duty cycles. They are also necessary for applications requiring both push and pull force. These cylinders not only retract faster, they also allow for better retraction control than single acting cylinders. More rigorous duty cycles are possible because the inherent design keeps the cylinder rod lubricated. All double-acting cylinders are equipped with safety relief valves to protect against over-pressurizing the rod end of the cylinder.

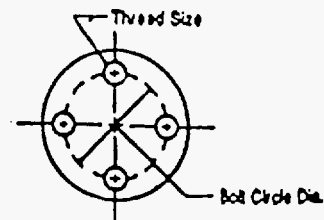
- Most models have threaded plungers to accommodate pulling attachments.
- All cylinders have a 2:1 factor of safety on material yield and comply fully with ASME/ANSI B30.1 safety standards.
- Tonnage gauges and swivel load caps are also available for many of these cylinders.
- The Pine cylinder line is available on a build-to-order basis for solid ram applications up to 664 ton capacity. (See page 29.)
- All models include high flow couplings.

**Double-Acting Solid Ram Cylinders**

Model Number	Order Number	Push Cap. (tons)	Stroke (in)	Pull Cap. (tons)	Closed Height (in)	Pressure at Cap. (psi)	Effective Area (sq in)	Pump Reservoir Cap. Req. (cu in)	Body Dia. (in)	Plunger Internal Thread Size X Length	Collar Thread Size X Length	Piston Rod Dia. (in)	Weight (lbs)
HS06T	1332201	50	6 1/4	13 1/4	19 1/4	9,054	11.05	48	5	1 - 12 x 1 1/2	5 - 12 x 1 3/4	3 1/4	85
HS012T	1332501		12	16.8	19 1/4			92					130
HS024T	1332601		24		31 1/4			184					223
H100-6DAT	133356	100	6 1/2	13 1/4	19 1/4	9,239	21.65	77	7	3 1/4 - 12 x 2 1/2	7 - 12 x 2 1/4	4	152
H100-12DAT	13951		12	40	19 1/4			151					187
H150-6DAT	13363		6 1/2	15 1/4	21 1/4			120					218
H150-12DAT	13953	150	12	61	21 1/4	9,041	33.18	236	8.5	3 1/2 - 12 x 2 3/4	8 1/2 - 12 x 2 3/4	5	295
RC-2006	13233		6	15 1/4	22 1/4			170					315
RC-20013	13234		13	72	22 1/4			368					440

Mounting Holes and Accessories

Cylinder Series	Thread Size	Bolt Circle Dia. (in)	Tonnage Gauge	Swivel Cap Number	Additional Height of Cap (in)
50 ton	1/4 - 11 x 3/4	3.75	1816301	18025	1/4
100 ton	1/4 - 11 x 1	4.25	1816001	18328	1 3/4
150 ton	1 - 8 x 1 1/4	5.00	1817101		
200 ton	1 - 8 x 1 1/4	5.00	1900501		



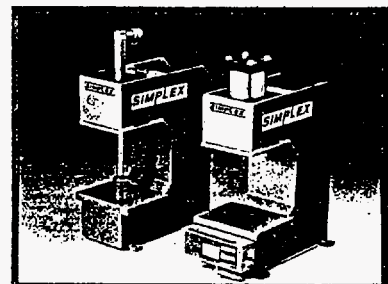
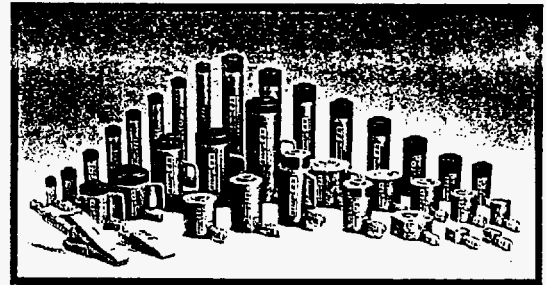


HYDRAULIC

AND

MECHANICAL

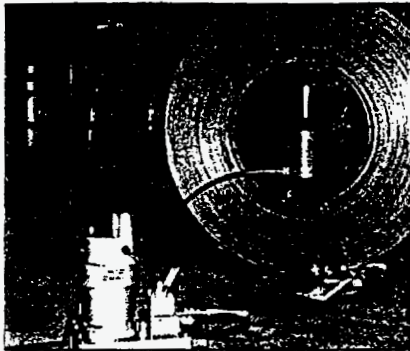
POWER



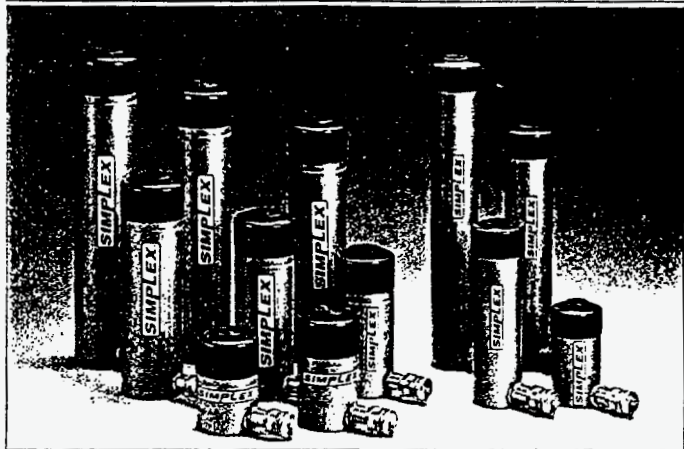
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SPRING RETURN - 15-25 TON CYLINDERS

Simplex Cylinders Quickly & Safely Reshape Steel Coils.

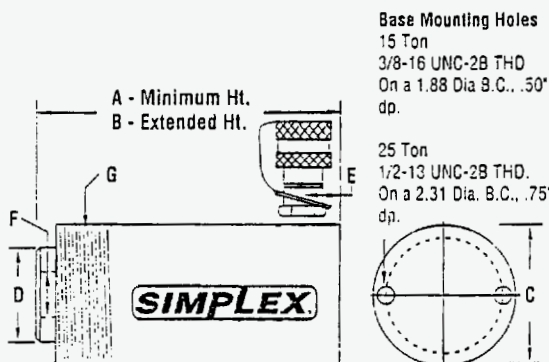


Large steel coils that were damaged in handling would not fit the arbor of a large steel slitting machine. Using a Simplex R256 cylinder and P70 Series pump, maintenance crews were able to reshape the coil I.D. saving time and expense in the process. "Simplex hydraulics were much faster and safer than the methods we used previously."

**BENEFITS/FEATURES**

Simplex 15 & 25 ton R Series rams are the choice when reliability & durability are key. Heavy duty steel construction, plated piston rods & large bronze bearings add up to tough, long lasting cylinders. Ideal for a wide range of applications at construction sites, mills, power plants, rail car shops & industrial maintenance.

- 13 Models
- High Flow, quality couplers with metal caps.
- Collar threads designed for full load.
- Base & piston mountings for easy fixturing.
- Removable load caps for flexibility & safety.
- Steel stop ring for piston blow-out protection.
- Plated piston to resist scoring & corrosion.
- Large bearings resist side load.
- Rod wiper protects inner cylinder from dirt.

DIAGRAM**Spring Return Cylinders 15 & 25 Ton Capacities**

Model Number	Cap. (tons)	Stroke (in)	A Min. Ht. (in)	B Ext. Ht. (in)	Ram Bore Dia. (in)	Effect Area (sq in)	Pres. @ Cap. (psi)	Oil Cap. Req'd (cu in)	C Body O.D. (in)	D Piston O.D. (in)	E Base To Port C/L (in)	F Piston I.D. Thrs. (in)	F Piston Thrd. Depth (in)	G Collar Thrs. (in)	G Collar Thrd. Lgth. (in)	Wgt. (lbs)	Sugstd. Hand Pump
R152	15	2	5 7/8	7 7/8	2	3.14	9,554	6.3	2 3/4	1 5/8	3/4	1 x 8	1	2 1/2 x 16	1 3/16	8.3	P42
R154		4	7 7/8	11 7/8				12.6								10.8	
R156		6	10 11/16	16 11/16				19.0								14.5	P140
R1510		10	14 11/16	24 11/16				31.4								19.5	
R1514		14	18 11/16	32 11/16				44.0								24.5	
R251	25	1	5 1/2	6 1/2	2 9/16	5.15	9,700	5.2	3 3/8	2 1/4	1	1 1/2 x 16	1 1/8	35/16 x 12	1 15/16	12.0	P42
R252		2	6 1/2	8 1/2				10.3								15.0	
R254		4	8 1/2	12 1/2				20.6								18.0	
R256		6 1/4	10 3/4	17				32.2								23.0	
R258		8 1/4	12 3/4	21				42.5								27.0	P140
R2510		10 1/4	14 3/4	25				52.8								31.0	
R2512		12 1/4	16 3/4	29				63.1								35.0	
R2514		14 1/4	18 3/4	33				73.4								39.0	

M&O

RECORD OF TELEPHONE CONVERSATION

FROM: MORRIE CHEN DATE: OCT. 3, 1995 TIME: 9:00 A.M.
LOCATION: 5TH FLR, 101 CONVENTION CENTER DR. SUBJECT: SNUG TIGHT OF BOLT.
LAS VEGAS, NV. 89109
TO: AISC ENGINEERING & RESEARCH P.O. NO. 04580826
LOCATION: CHICAGO OTHER REF. _____

PER TELEPHONE CONVERSATION WITH AISC ENGINEERING AND
RESEARCH STAFF, THE TENSION IN BOLT IS NEGLIGIBLE WHEN
THE BOLT IS BROUGHT TO A SNUG-TIGHT CONDITION. SNUG TIGHT
IS DEFINED AS THE TIGHTNESS THAT EXIST WHEN THE PLIES OF THE
JOINT ARE IN FIRM CONTACT.

Morrie S. Chen

CC: M.E. Taylor

M.D. STINE

D. J. ROGERS

ATTACHMENT VII

DI: BABEE0000-01717-0200-00003, REV 02

TITLE: ESF Ground Support - Structural Steel Analysis

Page VII- 1 of VII-10

ATTACHMENT VII

**MISCELLANEOUS SHOP FABRICATION TOLERANCES
AND STEEL SET INSTALLATION TOLERANCES***

***Not Addressed Elsewhere within this Analysis**

SHOP FABRICATION TOLERANCES:**A. Source of Fabrication & Installation Tolerances.**

Tolerances are established generally based on AISC recommendations. In some instances, Constructor's comments and suggestions were incorporated. Tolerances for structural steel items will be shown on the fabricator's shop drawings that are reviewed and approved by the A/E. The tolerances in Section B, below are representative of good workmanship and industry practice and the values shown are to be used in developing the fabrication drawings (also refer to the Commercial Pantex Sika Catalog information in Attachment V for tolerances common to the steel set fabrication industry). Any deviations from the tolerances indicated must be shown on the shop drawings and will be subject to A/E review and approval. Tolerances which relate to the critical design attributes of Section 8.5 in the Body of the Analysis are described in Section C, below.

B. Mill and Fabrication Tolerances.

1. Mill tolerances shall be in accordance with AISC M016, pages 1-145 to 1-158, and ASTM A6/A6M.
2. The following fabrication tolerances are non-critical and are in accordance with standard industry practice for fabricating steel sets and miscellaneous associated structural steel. In addition, judgement, based on observed field conditions, and experience gained from previously installed steel sets, result in upper bound tolerances for bending and fabrication as follows:
 - a. Bending Tolerances: After bending, all steel shapes shall conform to mill tolerances except as allowed below for bounding the upper limits of the tolerances for bending:
 - Departure from true template between rib ends - 1/2" max. (based on Attachment V).
 - Departure from true template for any one point - 1/4" max. in any gage length of 4'-0" max.
 - Flange droop - 1/4" max.
 - Deviation from flat for web buckling - 3/16" max. within 1/2 beam depth from each end.

- Deviation from nominal beam depth - 1/4" (minus) max.
 - Sweep in beams between end plates will be allowed to vary from established mill rolling tolerances, but shall not exceed 5 inches.
- b. Fabrication Tolerances - Tolerances shall not exceed the following upper bounding limits:
- Departure from theoretical plane of face of butt plate - 1/4" max.
 - Gap between butt plate and beam end - 1/16" max. for 75% of bearing prior to welding contact. Excess gap filled with weld.
 - Tie rod hole spacing in a group - 3/8" max. tolerance on dimension between holes as shown on shop drawings.
 - Tie rod hole group spacing - $(\pm) 3/8"$ on dimension from W-shape centerline, and $(\pm) 1"$ on dimension along the length of the beam (all dimensions as shown on shop drawings).
 - Deviation of sheared plate dimensions from dimension shown - $(\pm) 1/8"$.
 - Deviation of holes within butt plate group - 3/16" max.
 - Deviation of butt plate holes after assembly - 3/16" max.
 - Camber and sweep permitted in straight structural members not to exceed mill rolling tolerances.

C. Installation Tolerances.

Some of the following installation features and their respective tolerances relate to selected critical design attributes of Section 8.5 in the Body of the Analysis. Where a tolerance on an installation feature is not critical, and not specifying a tolerance will have no effect on the capability of the steel set to perform its safety related function, it is so noted as a non-critical feature. Similarly, critical features important to performance are also noted and will require QA Controls:

1. Location on Inverts (Critical):

Steel sets shall be located away from the joints in the concrete invert segments a sufficient distance to prevent damage or overstress in the invert segment. The clear distance from the edge of the steel set foot plate to edge of invert segment at joints shall be 4" minimum (Page VII-6). In addition, the inside edge of the W8x31 steel set flange shall not be offset inward from the inside edge of the invert segment curb by more than 5/8-inch (Attachment III.E, Page III-83). Similarly, the W6x20 shall not be offset beyond the inside edge of the invert segment curb by more than 1-1/2 inches (Attachment III.E, Page III-84).

2. Spacing Tolerance Parallel to Longitudinal Tunnel Centerline (Critical):

Steel set spacing (2 ft, 4 ft or 6 ft, see Table 14, Ref. 5.20) is controlled by the length of the pipe spacers, which are snugged into position when the tie rods are tightened. It may occasionally be necessary to add shims between the end of the pipe spacers and the web of the ring beam, or to cut a short section off the end of the pipe spacers, to adjust set spacing due to a buildup of tolerances when a series of sets have been erected through a given reach of tunnel. There is no tolerance for decreasing the set spacing to less than the nominal value represented by Table 14 in Ref. 5.20. By inspection of the steel set interaction equations of Attachments I & III.A and the lagging analysis of Attachment III.B, it is judged that an increase of up to 2 inches beyond the nominal set spacing will not adversely affect the load carrying capacity of the steel set or lagging.

3. Tie Rod Spacing (Critical):

The spacing of the tie rods along the centerline of the steel set W-shape shall not exceed 35°. Tie rods shall be located within the foot segment, no more than 7° from the foot segment base plate. In addition, the tie rods shall be located 1/2" inside of centerline of the W-shape (\pm) 3/8".

4. Expansion/Blocking of the Steel Set (Critical):

The critical attribute relating to this tolerance is that the set, via the lagging, be forced to make positive contact with the as-excavated tunnel crown and walls to the extent practical, i.e. consistent with standard industry practice (see Section 8.5F). This is accomplished by either expanding the set using jacks, or blocking the set where voids occur, or a combination of both as appropriate. Because the set is often pre-assembled and lagged under cover of the tail shield on the TBM (for obvious safety reasons), there is no way to verify/quantify the number or location of points the set or lagging actually makes contact with the rock. This sort of verification is not considered necessary as long as experienced supervision is available to oversee the steel set erection process. Therefore, there is not an appropriate tolerance to control this feature.

5. Vertical Alignment (Non-Critical):

The vertical plane of the steel sets shall be nominally perpendicular to the horizontal axis of the tunnel. The maximum offset of 16-1/4" at the crown measured relative to the base calculated on Page VII-8 is an upper bound limit on the worst offset possible due to tunnel grade, fabrication tolerance on steel set bearing plates, and invert segment bearing surface slope. As shown on Page VII-10, vertical misalignment of the steel set will not overstress the steel set even at this worst case offset. It is judged that normal installation of the foot plate flat on the invert segment curb will adequately control the installation. Therefore, no tolerance is necessary to control this feature.

6. Skew Parallel to Longitudinal Tunnel Centerline (Non-Critical):

Skew is not considered important, as the erection process will only tolerate a minor amount of skewing before it is impossible to insert the bolts used to make up the joints. Therefore, no tolerance is necessary to control this feature.

7. Diametrical Tolerance Transverse to Longit. Tunnel Centerline (Non-Critical):

There is no tolerance associated with the vertical and horizontal placement of the steel set transverse to the longitudinal tunnel centerline. The overriding concern is that the set be expanded/blocked as stated under Section C.4, above.

8. Bolted Connections (Critical):

All bolted connections using ASTM A307 (or higher strength) bolts shall be installed to a snug tight condition. Bolt head and nut or washer(s) shall make contact with the joint plates. Snug tightness shall be in accordance with AISC M016, except that gaps between joint plates and shims may exceed 1/16 inch if plates or plates and shims contact at any point in the connection plane. As a result of vibrations due to the passage of rail traffic over the invert segment rails and seating of the connection plates as the sets take load, it is anticipated that the nuts on the steel set connection bolts might loosen over time. This condition will be mitigated by the requirement in the construction specifications (Section 01501, Paragraph 3.01J - Reference 5.4) that the Constructor provide "routine inspection, maintenance, monitoring and repair (as required) of the permanent function ground support system" in order to meet the maintainable life of 100 years required for incorporation into a potential repository. This inspection and repair program will ensure that the steel set connections are maintained during the life of the ESF, but will have to be carried forward (along with other ground support maintenance tasks) through the ESF operations phase into repository construction and operations, when the ground support begins to perform its nuclear safety-related function.

STEEL SET INSTALLATION TOLERANCES:MINIMUM EDGE DISTANCE FROM STEEL FOOT PLATE TO SEGMENT JOINTS

P_c = COMPRESSIVE STRESSES
IN CONCRETE SEGMENT
DUE TO STEEL SET
LOADS

TRY 4" MINIMUM DISTANCE
FROM EDGE OF STEEL
SET FOOT PLATE TO ϕ
SEGMENT JOINT IS
ESTABLISHED TO ENSURE
THAT THE BOUNDARY LINE FOR
 P_c DISTRIBUTION SHOULD BE
WITHIN THE FIRST LAYER OF
REBAR'S. (SEE THE SKETCHES)

CONCRETE
SEGMENT
(REF. 5.7 & 5.8)

2 W 8 x 31

ϕ 2 CONCRETE
SEGMENT
JOINT

EDGE STEEL SET
FOOT PLATE

4" MIN.

USE:

4" MIN.

2" (MIN)

EDGE OF
SEGMENT

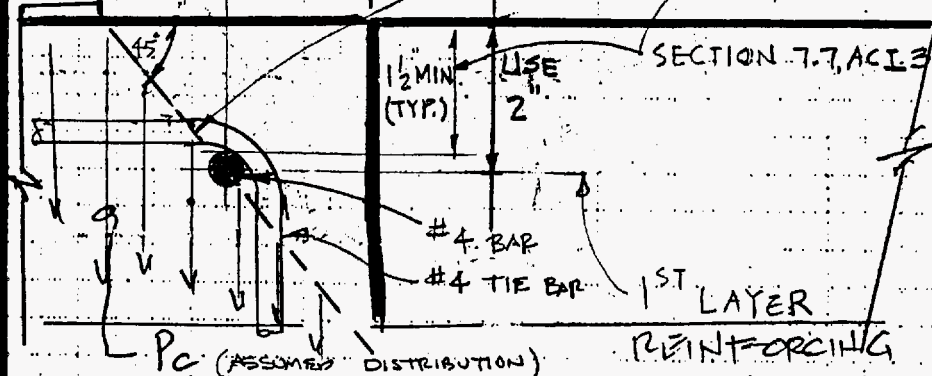
$$\begin{aligned} * 2" \text{ TO } \phi &= \frac{1}{2} \text{ CLR} + \frac{1}{4} \text{ (MIN) TIE} + \frac{1}{2} \left(\frac{4}{8} \right) \#4 \\ &= 2" \text{ MIN TO } \phi \#4 \end{aligned}$$

BOUNDARY LINE FOR P_c DISTRIBUTION
SHOULD BE

SECTION 7.7 ACI 318 WITHIN THE

1ST LAYER
OF REINFORCING

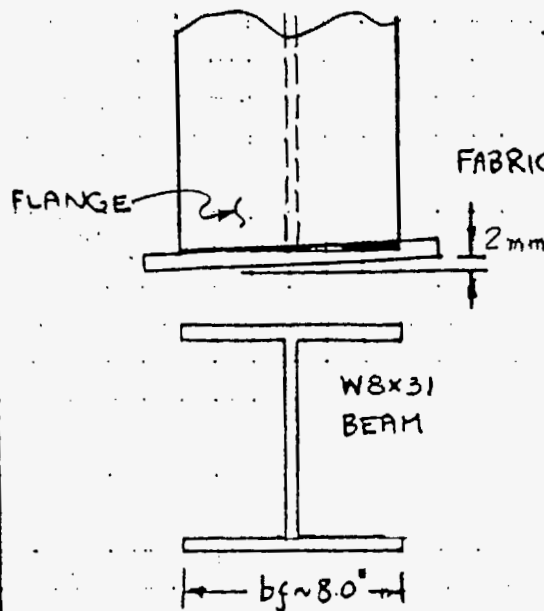
BAR'S WHICH WILL
BE AIDED IN RESISTING
SHEAR FAILURE @ CORNER
BY #4 TIE BAR'S.



P_c (ASSUMED) DISTRIBUTION

1ST LAYER
REINFORCING BAR'S.

$x_1 = \underline{345 \text{ mm}} (\approx \underline{13.6"})$ UNDS 9/11/95

STEEL SET/BEARING PLATE

$$\text{FABRICATION TOLERANCE} = \frac{1}{16}'' \text{ --- (See Para. II.2.B, p. VII-2)} \\ = 1.588 \text{ mm USE } 2 \text{ mm}$$

VERTICAL OFF-SET INDUCED BY
1mm FABRICATION OFF-SET FROM
PERPENDICULAR

$$\frac{1}{203} (762 - 0.715)(1000) = \underline{34.00 \text{ mm} = (z_2)}$$

CONCRETE SEGMENT

1.22m
(REF. 5.8)

BEARING SURFACE
ON EDGE OF SEGMENT

$$\frac{3}{4}'' = 6.35 \text{ mm SAY } 6 \text{ mm} **$$

5mm FABRICATION TOLERANCE
(Code Ref. 4.4.1, ACT 301) *

VERTICAL OFF-SET INDUCED
BY 6mm CASTING TOLERANCE

* NOTE:

FABRICATION TOLERANCE OF $\frac{1}{4}''$ FROM ACT 301, TABLE 4.3.1 IS $\frac{1}{4}''$ IN 10 FT FOR CAST-IN-PLACE FORMS. THIS VALUE IS CONSERVATIVELY APPLIED HERE AS THE MAXIMUM TOLERANCE ON THE FLATNESS OF THE PRECAST STEEL FORMER INVERT GRABS ACROSS ONLY 4 FT.

$$\frac{6 \text{ mm}}{1.22 (1000)} (762 - 0.715)(1000)$$

$$= \underline{34.0 \text{ mm} = (z_3)}$$

CUMMULATIVE TOLERANCE

$$\Sigma z = z_1 + z_2 + z_3$$

1. LINE GRADE @ 5.0% 345.0 mm (z₁)

2. STEEL SET/BEARING PLATE. 34.0 mm (z₂)

3. CONCRETE INVERT SEGMENT. 34.0 mm (z₃)

$$\underline{413.0 \text{ mm} \approx (16\frac{1}{4}'')}$$

INSTALLATION
TOLERANCE = $16\frac{1}{4}''$
(413 mm)

** THESE VALUES ROUNDED DOWN DUE TO CONSERVATION IN INITIAL VALUE SELECTED ($\frac{1}{4}''$) & UNLIKELYHOOD OF ALL WORST TOLERANCES OCCURRING SIMULTANEOUSLY

IMPACT OF CUMULATIVE OFFSET ON STEEL SET DESIGN:

THE OFFSET OF $16\frac{1}{4}$ " FROM PLUMB AS SHOWN ON PAGE VII-8 OF THIS ATTACHMENT FOR THE STEEL SETS IS BASED ON STEEL FABRICATION TOLERANCE, CONCRETE SEGMENT TOLERANCE AND THE TUNNEL GRADE. THE OFFSET FROM PLUMB COULD CREATE ECCENTRIC LOAD FROM UTILITY WEIGHTS TO STEEL SET AND INDUCE A LOCAL BENDING

IN STEEL SET WEB. REFERRING TO FIG. 1 ON THE RIGHT, THE ROCK LOAD IS RESOLVED INTO TWO COMPONENTS, THE PERPENDICULAR TO STEEL SET FLANGE SURFACE COMPONENT IS THE TRUE ROCK PRESSURE ON STEEL SET AND SHOULD INDUCE NO ECCENTRIC LOAD. THE PARALLEL TO STEEL SET FLANGE SURFACE COMPONENT IS SUPPORTED BY THE ROCK ITSELF. THE DESIGN OF STEEL SET USES FULL ROCK, NOT THE COMPONENT, WHICH IS CONSERVATIVE.

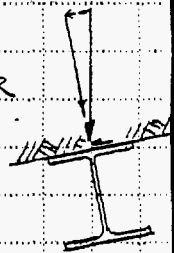


FIG. 1

TO EVALUATE THE IMPACT OF THE CUMULATIVE OFFSET

ON STEEL SET DESIGN, A CALCULATION TO OBTAIN THE MAXIMUM STRESS IN WB X 31 WEB IS SHOWN ON NEXT PAGE.

THE MIDDLE SUPPORT OF VENTILATION DUCTS REPRESENTS THE HEAVIEST UTILITY LOAD ON STEEL SET & IS CHOSEN TO DEMONSTRATE THE WORST CONDITION. THE RESULT SHOWS THE MAXIMUM STRESS INDUCED BY CUMULATIVE TOLERANCE IS MUCH LESS THAN ALLOWABLE.

STRESS AT CROWN OF STEEL SET INDUCED BY ECCENTRIC LOAD FROM INSTALLATION CUMMULATIVE OFFSET :

MAXIMUM UTILITY LOAD AT THE CROWN OF STEEL SET SUPPORTING VENTILATION DUCTS

$$P = 3.88 \text{ K} \text{ --- PAGE II-11, ATTACHMENT II}$$

FOR 413 mm (OR 16") CUMMULATIVE OFFSET,

$$\begin{aligned} \text{ANGLE } \theta &\approx \tan^{-1} \frac{\text{CUMMULATIVE OFFSET}}{\text{TUNNEL DIAMETER} - \text{CONCRETE SEGMENT THICKNESS}} \\ &= \tan^{-1} \frac{413 \text{ mm} / 1000}{7.62 - 0.715} = 0.05931 \\ &= 3.423^\circ \end{aligned}$$

FORCES ACTING AT SUPPORT

$$P_Y = P \cos \theta = 3.873 \text{ K} \approx P = 3.88 \text{ K}$$

$$P_X = P \sin \theta = 0.23 \text{ K}$$

P_X WILL INDUCE A LOCAL BENDING IN WB WEB.

SECTION MODULUS OF THE PORTION OF WEB IN BENDING DUE TO P_X

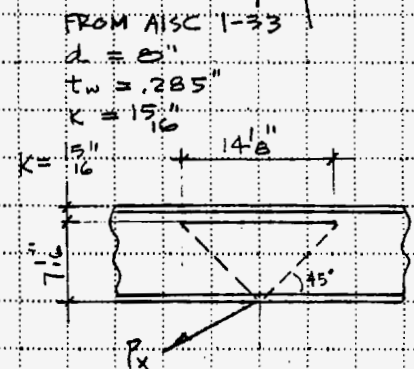
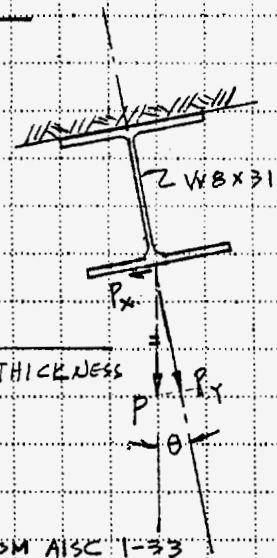
$$= \frac{bt^3}{6} = 14.125 \times (0.285)^3 / 6 = 0.1912 \text{ IN}^3$$

$$M = 0.23 \text{ K} \times 7.0625 \text{ IN} = 1.624 \text{ K-IN}$$

$$f_b = \frac{1.624}{0.1912} = 8.49 \text{ KSI} \ll F_b = 0.75 P_Y = 27 \text{ KSI} \text{ --- O.K.}$$

(AISC F2-1)

THE INDUCED STRESS IS WITHIN THE ALLOWABLE STRESS, AND THE ABOVE STRESS IS NOT ADDITIVE TO STEEL SET DESIGN UNITY CHECK. THEREFORE, THE IMPACT OF STEEL SET INSTALLATION TOLERANCES ON STEEL SET DESIGN IS NOT SIGNIFICANT.



ATTACHMENT VIII STRUCTURAL STEEL SET USING W6X20

PURPOSE AND DESCRIPTION

The purpose of the attachment VIII is to confirm the capacity of the W6X20 steel shape to WITHSTAND THE LONG TERM ROCK LOAD AND TO DETERMINE THE MAXIMUM ALLOWABLE JACKING LOAD BASED ON A JACKING PROCESS SIMILAR TO THAT USED FOR THE W8X31 STEEL SETS.

For jacking loads two computer analysis were performed, one with 20 Ton jacking load and another with 17 ton jacking load. The results are that the W6X20 shape is adequate for 17 Ton jacking, but not for 20 Ton jacking. (See "Summary of computer analyses for W6X20 steel shape" at the end of this attachment).

For all inputs used in the computer analyses performed in this attachment, see Attachment I, the 51 degrees runs. The jacking bracket for jacking without insert is situated at 51 degrees with the vertical axis. (See page IX-3).

The configuration from Attachment I can be used in this analysis because the difference in radius is 1" which represents a difference of less than 1% in configuration. From the resulting interaction coefficient for the 17 Ton jack (see page VIII-26), we can conclude that the results are adequate.

W6 x 20. 17 TON JACKING.

BOTH SIDES @ 51°

CRITICAL MEMBERS: 3, 4, 41 & 42.

P = 32.2 K M = 15.41 K' (FROM
STERN 3D - 17 TON)

UNBRACED LENGTHS.

$L_y = 7.43' = 89.16'' = 35^\circ$ TIE ROD SPACING

$L_x = \text{distance between blocking} = 4 \times 18.79'$
 $\approx 75'$

Since $r_x > r_y$, L_x DOES NOT GOVERN FOR
COLUMN BUCKLING

ARCH LENGTH FROM SPRING LINE TO

CONCRETE INVERT = $\frac{\pi r A}{180} = \frac{\pi (146) (90^\circ - 31^\circ)}{180}$

ARCH LENGTH = $\frac{\pi \times 146 \times 59}{180} = 150.34266$

MEMBER LENGTH = $\frac{150.34266}{8 (\text{No. of members})} = 18.79$ in

COMPRESSIVE FLANGE
UNBRACED LENGTH -

So $L_x \approx 3.0 \times 18.79'' \approx 56.37''$

SEE MOMENT DIAGRAM - FOR DISTANCE BETWEEN
INFLEXION POINTS ≈ 3 MEMBER LENGTHS =
UNBRACED COMPRESSIVE FLANGE LENGTH

$\frac{K L_x}{r_x} = \frac{56.37}{2.66} = 21.19$ $P_e = 332.9$

AKS < 5-122

DETERMINE ALLOWABLE STRESSES

F_a USE K=1 - CONSERVATIVELY

$$\frac{K L_y}{r_y} = \frac{89.16}{1.50} = 59.44 - \text{CRITICAL BY INSPECTION}$$

$$F_a = 17.49 \text{ ksi} \quad \text{AISC TABLE C-36}$$

F_b $L_c = \frac{76 \text{ bf}}{\sqrt{F_y}} = \frac{76 \times 6.02}{6} = 76'' \text{ (F1-2)}$

AISC $F_b = 0.66 F_y = 36 \times 0.66 = 24 \text{ ksi}$

5-45 (F1-1) -

DETERMINE INTERACTION COEFFICIENTAISC 5-54C_m = 1.0 AISC pg 5-55

$$H 1-1: \frac{f_a}{F_a} + \frac{C_m f_b}{\left(1 - \frac{f_a}{F_{ex}}\right) F_b} = \frac{5.486}{17.49} + \frac{13.8}{\left(1 - \frac{5.486}{332.9}\right) 24}$$

$$f_a = \frac{32.2}{5.87} = 5.486 \text{ ksi} \quad = .3137 + .585 = .898 < 1.0$$

$$f_b = \frac{15.41 \times 12}{13.4} = 13.8 \text{ ksi}$$

(OK)

$$H 1-2 : \frac{f_a}{21.6} + \frac{f_b}{24} = \frac{5.486}{21.6} + \frac{13.8}{24} = .829 < 1$$

NOT CRITICAL

CHECK 20 TON JACKS

CRITICAL MEMBERS 3, 4, 41, 42 FROM
STER 3 D.
20 TON JACK

Partial = 37.81 K M = 17.6 K

$$f_a = \frac{37.81}{5.87} = 6.44 \text{ ksi}$$

$$f_b = \frac{17.6 \times 12}{13.4} = 15.76 \text{ ksi}$$

$$\left. \begin{array}{l} F_a = 17.49 \text{ K} \\ F_b = 24 \text{ K} \\ F_c = 332.9 \text{ KSI} \end{array} \right\}$$

SEE SHEET VIII-2

AISC 5-54 - H 1-1.

$$\frac{6.44}{17.49} + \frac{15.76}{\left(1 - \frac{6.44}{332.9}\right) 24} = .368 + .67 = 1.038$$

> 1. NG.

HENCE 20 T JACK IS TOO HIGH. -

TITLE: ESF Ground Support - Structural Steel Analysis

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*****
*                                     *
*           S T A A D - III          *
*           Revision 16.0b           *
*           Proprietary Program of   *
*           RESEARCH ENGINEERS, Inc. *
*           Date=    SEP 11, 1995    *
*           Time=    13:42:18        *
*                                     *
*****

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1. STAAD PLANE BABEE0000-01717-0200-00003 ATTACHMENT VIII
2. * ESF GROUND SUPPORT-STRUCTURAL STEEL ANALYSIS REV 00
3. * FILE STLVR3D
4. * 20 TON JACKS APPLIED BOTH SIDES @ 51 DEGREES
5. * W6X20
6. UNIT FT KIP
7. JOINT COORDINATES
8. 3 2.71 2.77 ; 4 2.43 3.13
9. 5 1.58 4.44 ; 6 0.90 5.85 ; 7 0.40 7.33 ; 8 0.10 8.87
10. 9 0.0 10.43 ; 10 0.08 11.79 ; 11 0.31 13.14 ; 12 0.68 14.45
11. 13 1.21 15.71 ; 14 1.86 16.90 ; 15 2.65 18.02 ; 16 3.56 19.03
12. 17 4.58 19.94 ; 18 5.69 20.73 ; 19 6.89 21.39 ; 20 8.15 21.91
13. 21 9.46 22.29 ; 22 10.80 22.52 ; 23 12.17 22.60 ; 24 13.53 22.52
14. 25 14.87 22.29 ; 26 16.18 21.91 ; 27 17.45 21.39 ; 28 18.64 20.73
15. 29 19.75 19.94 ; 30 20.77 19.03 ; 31 21.68 18.02 ; 32 22.47 16.90
16. 33 23.13 15.71 ; 34 23.65 14.45 ; 35 24.03 13.14 ; 36 24.26 11.79
17. 37 24.33 10.43 ; 38 24.23 8.87 ; 39 23.93 7.33 ; 40 23.44 5.85
18. 41 22.76 4.44 ; 42 21.90 3.13 ; 43 21.62 2.77
19. MEMBER INCIDENCE
20. 3 3 4 42
21. UNIT KIP INCH
22. MEMBER PROPERTIES
23. 3 TO 42 TA STA W6X20
24. CONSTANTS
25. E 29000.0 ALL
26. DENSITY 0.00028 ALL
27. BETA 0 ALL
28. UNIT FT
29. SUPPORT
30. 3 7 11 35 39 43 FIXED BUT FY MZ
31. 22 24 FIXED BUT FX MZ
32. 16 30 PINNED
33. UNIT KIP
34. LOAD 1
35. SELF WEIGHT Y -1.0
36. LOADING 2
37. * 20 TON JACKS @ BOTH SIDES
38. * TO OBTAIN LOADS FOR 20 TON JACKS: MULTIPLY
39. * THE LOADS FOR 25 TON JACKS BY 0.80
40. * THEN, MULTIPLY MOMENTS BY 5/12 BECAUSE
41. * EXCENTRICITY IS 5" FOR W6X20
42. * 31.47 X .8 = 25.176 K
43. * 38.86 X .8 = 31.088 K
44. * 40K X 5"/12 = 16.667 FT K
45. JOINT LOADING
46. 3 FX -25.176
47. 43 FX 25.176

TITLE: ESF Ground Support - Structural Steel AnalysisPage: VIII-6 of VIII-27

48. 3 43 FY 31.088
49. 43 MZ -16.667
50. 3 MZ 16.667
51. LOADING COMBINATION 3
52. 1 2.5 2 1.0
53. PERFORM ANALYSIS

P R O B L E M S T A T I S T I C S

NUMBER OF JOINTS/MEMBER+ELEMENTS/SUPPORTS = 41/ 40/ 10
ORIGINAL/FINAL BAND-WIDTH = 1/ 1
TOTAL PRIMARY LOAD CASES = 2, TOTAL DEGREES OF FREEDOM = 111
SIZE OF STIFFNESS MATRIX = 666 DOUBLE PREC. WORDS
TOTAL REQUIRED DISK SPACE = 0.07 MEGA-BYTES

++ PROCESSING ELEMENT STIFFNESS MATRIX.	13:42:21
++ PROCESSING GLOBAL STIFFNESS MATRIX.	13:42:21
++ PROCESSING TRIANGULAR FACTORIZATION.	13:42:22
++ CALCULATING JOINT DISPLACEMENTS.	13:42:22
++ CALCULATING MEMBER FORCES.	13:42:22

54. LOAD LIST 3
55. PRINT ANALYSIS RESULTS

JOINT DISPLACEMENT (INCH RADIANS)

STRUCTURE TYPE = PLANE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
3	3	0.00000	0.08192	0.00000	0.00000	0.00000	0.00474
4	3	-0.01809	0.06631	0.00000	0.00000	0.00000	0.00380
5	3	-0.04977	0.04079	0.00000	0.00000	0.00000	0.00068
6	3	-0.03522	0.04325	0.00000	0.00000	0.00000	-0.00138
7	3	0.00000	0.05094	0.00000	0.00000	0.00000	-0.00102
8	3	0.00240	0.04800	0.00000	0.00000	0.00000	0.00006
9	3	-0.00041	0.04444	0.00000	0.00000	0.00000	0.00002
10	3	0.00129	0.04139	0.00000	0.00000	0.00000	-0.00001
11	3	0.00000	0.03866	0.00000	0.00000	0.00000	0.00077
12	3	-0.02438	0.04216	0.00000	0.00000	0.00000	0.00125
13	3	-0.04181	0.04588	0.00000	0.00000	0.00000	0.00042
14	3	-0.04065	0.04146	0.00000	0.00000	0.00000	-0.00084
15	3	-0.02225	0.02440	0.00000	0.00000	0.00000	-0.00173
16	3	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00135
17	3	0.00747	-0.00918	0.00000	0.00000	0.00000	-0.00038
18	3	0.00726	-0.00984	0.00000	0.00000	0.00000	0.00011
19	3	0.00470	-0.00638	0.00000	0.00000	0.00000	0.00026
20	3	0.00246	-0.00246	0.00000	0.00000	0.00000	0.00021
21	3	0.00122	-0.00026	0.00000	0.00000	0.00000	0.00009
22	3	0.00060	0.00000	0.00000	0.00000	0.00000	0.00003
23	3	0.00001	0.00050	0.00000	0.00000	0.00000	0.00000
24	3	-0.00057	0.00000	0.00000	0.00000	0.00000	-0.00003
25	3	-0.00119	-0.00024	0.00000	0.00000	0.00000	-0.00009
26	3	-0.00242	-0.00242	0.00000	0.00000	0.00000	-0.00021
27	3	-0.00465	-0.00633	0.00000	0.00000	0.00000	-0.00026
28	3	-0.00722	-0.00979	0.00000	0.00000	0.00000	-0.00011
29	3	-0.00745	-0.00916	0.00000	0.00000	0.00000	0.00038
30	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00135
31	3	0.02221	0.02437	0.00000	0.00000	0.00000	0.00173
32	3	0.04065	0.04146	0.00000	0.00000	0.00000	0.00085
33	3	0.04197	0.04601	0.00000	0.00000	0.00000	-0.00043
34	3	0.02425	0.04229	0.00000	0.00000	0.00000	-0.00125
35	3	0.00000	0.03866	0.00000	0.00000	0.00000	-0.00076
36	3	-0.00141	0.04137	0.00000	0.00000	0.00000	0.00000
37	3	-0.00015	0.04438	0.00000	0.00000	0.00000	-0.00004
38	3	-0.00292	0.04794	0.00000	0.00000	0.00000	-0.00004
39	3	0.00000	0.05078	0.00000	0.00000	0.00000	0.00106
40	3	0.03606	0.04302	0.00000	0.00000	0.00000	0.00141
41	3	0.05073	0.04051	0.00000	0.00000	0.00000	-0.00070
42	3	0.01832	0.06678	0.00000	0.00000	0.00000	-0.00385
43	3	0.00000	0.08257	0.00000	0.00000	0.00000	-0.00479

SUPPORT REACTIONS -UNIT KIP FEET STRUCTURE TYPE = PLANE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
3	3	3.59	0.00	0.00	0.00	0.00	0.00
7	3	21.42	0.00	0.00	0.00	0.00	0.00
11	3	17.06	0.00	0.00	0.00	0.00	0.00
35	3	-17.11	0.00	0.00	0.00	0.00	0.00
39	3	-21.43	0.00	0.00	0.00	0.00	0.00
43	3	-3.56	0.00	0.00	0.00	0.00	0.00
22	3	0.00	-1.48	0.00	0.00	0.00	0.00
24	3	0.00	-1.49	0.00	0.00	0.00	0.00
16	3	-11.12	-28.26	0.00	0.00	0.00	0.00
30	3	11.15	-28.25	0.00	0.00	0.00	0.00

MEMBER END FORCES STRUCTURE TYPE = PLANE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
3	3	3	37.79	2.05	0.00	0.00	0.00	-16.67
		4	-37.77	-2.03	0.00	0.00	0.00	17.60
4	3	4	37.81	-1.20	0.00	0.00	0.00	-17.60
		5	-37.75	1.24	0.00	0.00	0.00	15.69
5	3	5	37.29	-5.98	0.00	0.00	0.00	-15.69
		6	-37.22	6.02	0.00	0.00	0.00	6.30
6	3	6	36.19	-10.56	0.00	0.00	0.00	-6.30
		7	-36.12	10.58	0.00	0.00	0.00	-10.21
7	3	7	30.30	5.73	0.00	0.00	0.00	10.21
		8	-30.22	-5.71	0.00	0.00	0.00	-1.23
8	3	8	30.70	1.80	0.00	0.00	0.00	1.23
		9	-30.63	-1.79	0.00	0.00	0.00	1.58
9	3	9	30.62	1.97	0.00	0.00	0.00	1.58
		10	-30.55	-1.97	0.00	0.00	0.00	1.11
10	3	10	30.15	5.31	0.00	0.00	0.00	-1.11
		11	-30.08	-5.30	0.00	0.00	0.00	8.37
11	3	11	33.98	-7.95	0.00	0.00	0.00	-8.37
		12	-33.92	7.97	0.00	0.00	0.00	-2.46
12	3	12	34.64	-3.75	0.00	0.00	0.00	2.46
		13	-34.58	3.77	0.00	0.00	0.00	-7.60
13	3	13	34.78	-0.24	0.00	0.00	0.00	7.60
		14	-34.72	0.27	0.00	0.00	0.00	-7.95
14	3	14	34.53	3.69	0.00	0.00	0.00	7.95
		15	-34.47	-3.65	0.00	0.00	0.00	-2.92
15	3	15	33.80	7.72	0.00	0.00	0.00	2.92
		16	-33.75	-7.68	0.00	0.00	0.00	7.55
16	3	16	5.61	-2.38	0.00	0.00	0.00	-7.55
		17	-5.56	2.43	0.00	0.00	0.00	4.26
17	3	17	5.79	-1.81	0.00	0.00	0.00	-4.26
		18	-5.76	1.86	0.00	0.00	0.00	1.76
18	3	18	5.93	-1.19	0.00	0.00	0.00	-1.76
		19	-5.90	1.25	0.00	0.00	0.00	0.09

MEMBER END FORCES STRUCTURE TYPE = PLANE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
19	3	19	6.00	-0.58	0.00	0.00	0.00	-0.09
		20	-5.98	0.64	0.00	0.00	0.00	-0.74
20	3	20	6.01	0.01	0.00	0.00	0.00	0.74
		21	-5.99	0.05	0.00	0.00	0.00	-0.77
21	3	21	5.96	0.62	0.00	0.00	0.00	0.77
		22	-5.95	-0.55	0.00	0.00	0.00	0.03
22	3	22	5.76	-0.27	0.00	0.00	0.00	-0.03
		23	-5.76	0.33	0.00	0.00	0.00	-0.39
23	3	23	5.76	0.34	0.00	0.00	0.00	0.39
		24	-5.76	-0.27	0.00	0.00	0.00	0.03
24	3	24	5.95	-0.55	0.00	0.00	0.00	-0.03
		25	-5.96	0.62	0.00	0.00	0.00	-0.77
25	3	25	5.99	0.05	0.00	0.00	0.00	0.77
		26	-6.01	0.01	0.00	0.00	0.00	-0.74
26	3	26	5.98	0.63	0.00	0.00	0.00	0.74
		27	-6.00	-0.56	0.00	0.00	0.00	0.08
27	3	27	5.90	1.26	0.00	0.00	0.00	-0.08
		28	-5.93	-1.21	0.00	0.00	0.00	1.76
28	3	28	5.76	1.86	0.00	0.00	0.00	-1.76
		29	-5.80	-1.81	0.00	0.00	0.00	4.26
29	3	29	5.56	2.43	0.00	0.00	0.00	-4.26
		30	-5.61	-2.38	0.00	0.00	0.00	7.55
30	3	30	33.77	-7.65	0.00	0.00	0.00	-7.55
		31	-33.82	7.69	0.00	0.00	0.00	-2.88
31	3	31	34.49	-3.62	0.00	0.00	0.00	2.88
		32	-34.55	3.66	0.00	0.00	0.00	-7.88
32	3	32	34.74	0.08	0.00	0.00	0.00	7.88
		33	-34.80	-0.05	0.00	0.00	0.00	-7.79
33	3	33	34.57	4.04	0.00	0.00	0.00	7.79
		34	-34.63	-4.01	0.00	0.00	0.00	-2.30
34	3	34	33.99	7.76	0.00	0.00	0.00	2.30
		35	-34.05	-7.74	0.00	0.00	0.00	8.27
35	3	35	30.08	-5.31	0.00	0.00	0.00	-8.27
		36	-30.15	5.32	0.00	0.00	0.00	0.99

MEMBER END FORCES STRUCTURE TYPE = PLANE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
36	3	36	30.56	-1.76	0.00	0.00	0.00	-0.99
		37	-30.63	1.76	0.00	0.00	0.00	-1.41
37	3	37	30.63	-1.78	0.00	0.00	0.00	-1.41
		38	-30.71	1.78	0.00	0.00	0.00	-1.37
38	3	38	30.22	-5.70	0.00	0.00	0.00	1.37
		39	-30.30	5.71	0.00	0.00	0.00	-10.32
39	3	39	36.06	10.83	0.00	0.00	0.00	10.32
		40	-36.14	-10.80	0.00	0.00	0.00	6.53
40	3	40	37.23	6.04	0.00	0.00	0.00	-6.53
		41	-37.30	-6.01	0.00	0.00	0.00	15.96
41	3	41	37.77	1.06	0.00	0.00	0.00	-15.96
		42	-37.83	-1.02	0.00	0.00	0.00	17.59
42	3	42	37.79	-2.01	0.00	0.00	0.00	-17.59
		43	-37.81	2.03	0.00	0.00	0.00	16.67

***** END OF LATEST ANALYSIS RESULT *****

56. CHECK CODE ALL

STAAD-III CODE CHECKING - (AISC)

ALL UNITS ARE - KIP FEET (UNLESS OTHERWISE NOTED)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
=====					
3	ST W6X 20	PASS	AISC- H1-2	0.963	3
		37.77 C	0.00	17.60	0.46
4	ST W6X 20	PASS	AISC- H1-2	0.964	3
		37.81 C	0.00	-17.60	0.00
5	ST W6X 20	PASS	AISC- H1-2	0.888	3
		37.29 C	0.00	-15.69	0.00
6	ST W6X 20	PASS	AISC- H1-2	0.671	3
		36.12 C	0.00	-10.21	1.56
7	ST W6X 20	PASS	AISC- H1-2	0.625	3
		30.30 C	0.00	10.21	0.00
8	ST W6X 20	PASS	AISC- H1-2	0.301	3
		30.63 C	0.00	1.58	1.56
9	ST W6X 20	PASS	AISC- H1-2	0.301	3
		30.62 C	0.00	1.58	0.00
10	ST W6X 20	PASS	AISC- H1-2	0.554	3
		30.08 C	0.00	8.37	1.37
11	ST W6X 20	PASS	AISC- H1-2	0.585	3
		33.98 C	0.00	-8.37	0.00
12	ST W6X 20	PASS	AISC- H1-2	0.560	3
		34.58 C	0.00	-7.60	1.37
13	ST W6X 20	PASS	AISC- H1-2	0.574	3
		34.72 C	0.00	-7.95	1.36
14	ST W6X 20	PASS	AISC- H1-2	0.573	3
		34.53 C	0.00	7.95	0.00
15	ST W6X 20	PASS	AISC- H1-2	0.552	3
		33.75 C	0.00	7.55	1.36
16	ST W6X 20	PASS	AISC- H1-3	0.331	3
		5.61 C	0.00	-7.55	0.00
17	ST W6X 20	PASS	AISC- H1-3	0.208	3
		5.79 C	0.00	-4.26	0.00
18	ST W6X 20	PASS	AISC- H1-3	0.114	3
		5.93 C	0.00	-1.76	0.00
19	ST W6X 20	PASS	AISC- H1-3	0.076	3
		5.98 C	0.00	-0.74	1.36
20	ST W6X 20	PASS	AISC- H1-3	0.077	3
		5.99 C	0.00	-0.77	1.36
21	ST W6X 20	PASS	AISC- H1-3	0.077	3
		5.96 C	0.00	0.77	0.00
22	ST W6X 20	PASS	AISC- H1-3	0.061	3
		5.76 C	0.00	-0.39	1.37
23	ST W6X 20	PASS	AISC- H1-3	0.061	3
		5.76 C	0.00	0.39	0.00
24	ST W6X 20	PASS	AISC- H1-3	0.077	3
		5.96 C	0.00	-0.77	1.36
25	ST W6X 20	PASS	AISC- H1-3	0.077	3
		5.99 C	0.00	0.77	0.00
26	ST W6X 20	PASS	AISC- H1-3	0.076	3
		5.98 C	0.00	0.74	0.00

ALL UNITS ARE - KIP FEET (UNLESS OTHERWISE NOTED)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
=====					
27	ST W6X 20	PASS	AISC- H1-3	0.114	3
		5.93 C	0.00	1.76	1.36
28	ST W6X 20	PASS	AISC- H1-3	0.208	3
		5.80 C	0.00	4.26	1.36
29	ST W6X 20	PASS	AISC- H1-3	0.331	3
		5.61 C	0.00	7.55	1.37
30	ST W6X 20	PASS	AISC- H1-2	0.552	3
		33.77 C	0.00	-7.55	0.00
31	ST W6X 20	PASS	AISC- H1-2	0.570	3
		34.55 C	0.00	-7.88	1.37
32	ST W6X 20	PASS	AISC- H1-2	0.572	3
		34.74 C	0.00	7.88	0.00
33	ST W6X 20	PASS	AISC- H1-2	0.567	3
		34.57 C	0.00	7.79	0.00
34	ST W6X 20	PASS	AISC- H1-2	0.581	3
		34.05 C	0.00	8.27	1.36
35	ST W6X 20	PASS	AISC- H1-2	0.550	3
		30.08 C	0.00	-8.27	0.00
36	ST W6X 20	PASS	AISC- H1-2	0.295	3
		30.63 C	0.00	-1.41	1.36
37	ST W6X 20	PASS	AISC- H1-2	0.295	3
		30.63 C	0.00	-1.41	0.00
38	ST W6X 20	PASS	AISC- H1-2	0.629	3
		30.30 C	0.00	-10.32	1.57
39	ST W6X 20	PASS	AISC- H1-2	0.675	3
		36.06 C	0.00	10.32	0.00
40	ST W6X 20	PASS	AISC- H1-2	0.898	3
		37.30 C	0.00	15.96	1.57
41	ST W6X 20	PASS	AISC- H1-2	0.964	3
		37.83 C	0.00	17.59	1.57
42	ST W6X 20	PASS	AISC- H1-2	0.963	3
		37.79 C	0.00	-17.59	0.00

***** END OF TABULATED RESULT OF DESIGN *****

57. PLOT DISPLACEMENT FILE
58. PLOT BENDING FILE
59. FINISH

***** END OF STAAD-III *****

DATE= SEP 11,1995 TIME= 13:42:26 *****

* For questions on STAAD-III/ISDS, contact: *
* RESEARCH ENGINEERS, Inc at (714) 974-2500 *

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*
*          S T A A D - III
*          Revision 16.0b
*          Proprietary Program of
*          RESEARCH ENGINEERS, Inc.
*          Date=      SEP 11, 1995
*          Time=      13:57:37
*
*****

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1. STAAD PLANE BABEE0000-01717-0200-00003 ATTACHMENT VIII
2. * ESF GROUND SUPPORT-STRUCTURAL STEEL ANALYSIS REV 00
3. * FILE STL RV3D
4. * 17 TON JACKS APPLIED BOTH SIDES @ 51 DEGREES
5. * W6X20
6. UNIT FT KIP
7. JOINT COORDINATES
8. 3 2.71 2.77 ; 4 2.43 3.13
9. 5 1.58 4.44 ; 6 0.90 5.85 ; 7 0.40 7.33 ; 8 0.10 8.87
10. 9 0.0 10.43 ; 10 0.08 11.79 ; 11 0.31 13.14 ; 12 0.68 14.45
11. 13 1.21 15.71 ; 14 1.86 16.90 ; 15 2.65 18.02 ; 16 3.56 19.03
12. 17 4.58 19.94 ; 18 5.69 20.73 ; 19 6.89 21.39 ; 20 8.15 21.91
13. 21 9.46 22.29 ; 22 10.80 22.52 ; 23 12.17 22.60 ; 24 13.53 22.52
14. 25 14.87 22.29 ; 26 16.18 21.91 ; 27 17.45 21.39 ; 28 18.64 20.73
15. 29 19.75 19.94 ; 30 20.77 19.03 ; 31 21.68 18.02 ; 32 22.47 16.90
16. 33 23.13 15.71 ; 34 23.65 14.45 ; 35 24.03 13.14 ; 36 24.26 11.79
17. 37 24.33 10.43 ; 38 24.23 8.87 ; 39 23.93 7.33 ; 40 23.44 5.85
18. 41 22.76 4.44 ; 42 21.90 3.13 ; 43 21.62 2.77
19. MEMBER INCIDENCE
20. 3 3 4 42
21. UNIT KIP INCH
22. MEMBER PROPERTIES
23. 3 TO 42 TA STA W6X20
24. CONSTANTS
25. E 29000.0 ALL
26. DENSITY 0.00028 ALL
27. BETA 0 ALL
28. UNIT FT
29. SUPPORT
30. 3 7 11 35 39 43 FIXED BUT FY MZ
31. 22 24 FIXED BUT FX MZ
32. 16 30 PINNED
33. UNIT KIP
34. LOAD 1
35. SELF WEIGHT Y -1.0
36. LOADING 2
37. * 17 TON JACKS @ BOTH SIDES
38. * TO OBTAIN LOADS FOR 17 TON JACKS: MULTIPLY
39. * THE LOADS FOR 20 TON JACKS BY 0.85
40. * THEN, MULTIPLY MOMENTS BY 5/12 BECAUSE
41. * EXCENTRICITY IS 5" FOR W6X20
42. * 25.176 K X .85 = 21.4 K
43. * 31.088 K X .85 = 26.425 K
44. * 34K X 5"/12 = 14.667 FT K
45. JOINT LOADING
46. 3 FX -21.4
47. 43 FX 21.4

48. 3 43 FY 26.425
49. 43 MZ -14.667
50. 3 MZ 14.667
51. LOADING COMBINATION 3
52. 1 2.5 2 1.0
53. PERFORM ANALYSIS

P R O B L E M S T A T I S T I C S

NUMBER OF JOINTS/MEMBER+ELEMENTS/SUPPORTS = 41/ 40/ 10
ORIGINAL/FINAL BAND-WIDTH = 1/ 1
TOTAL PRIMARY LOAD CASES = 2, TOTAL DEGREES OF FREEDOM = 111
SIZE OF STIFFNESS MATRIX = 666 DOUBLE PREC. WORDS
TOTAL REQUIRED DISK SPACE = 0.07 MEGA-BYTES

++ PROCESSING ELEMENT STIFFNESS MATRIX.	13:57:40
++ PROCESSING GLOBAL STIFFNESS MATRIX.	13:57:41
++ PROCESSING TRIANGULAR FACTORIZATION.	13:57:41
++ CALCULATING JOINT DISPLACEMENTS.	13:57:41
++ CALCULATING MEMBER FORCES.	13:57:42

54. LOAD LIST 3
55. PRINT ANALYSIS RESULTS

JOINT DISPLACEMENT (INCH RADIANS)

STRUCTURE TYPE = PLANE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
3	3	0.00000	0.06971	0.00000	0.00000	0.00000	0.00413
4	3	-0.01575	0.05615	0.00000	0.00000	0.00000	0.00331
5	3	-0.04322	0.03410	0.00000	0.00000	0.00000	0.00059
6	3	-0.03055	0.03632	0.00000	0.00000	0.00000	-0.00120
7	3	0.00000	0.04307	0.00000	0.00000	0.00000	-0.00089
8	3	0.00230	0.04063	0.00000	0.00000	0.00000	0.00004
9	3	-0.00010	0.03760	0.00000	0.00000	0.00000	0.00003
10	3	0.00122	0.03503	0.00000	0.00000	0.00000	0.00000
11	3	0.00000	0.03274	0.00000	0.00000	0.00000	0.00065
12	3	-0.02067	0.03571	0.00000	0.00000	0.00000	0.00106
13	3	-0.03541	0.03885	0.00000	0.00000	0.00000	0.00036
14	3	-0.03442	0.03510	0.00000	0.00000	0.00000	-0.00071
15	3	-0.01884	0.02066	0.00000	0.00000	0.00000	-0.00147
16	3	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00115
17	3	0.00634	-0.00780	0.00000	0.00000	0.00000	-0.00033
18	3	0.00618	-0.00839	0.00000	0.00000	0.00000	0.00009
19	3	0.00402	-0.00548	0.00000	0.00000	0.00000	0.00022
20	3	0.00212	-0.00216	0.00000	0.00000	0.00000	0.00018
21	3	0.00105	-0.00026	0.00000	0.00000	0.00000	0.00008
22	3	0.00051	0.00000	0.00000	0.00000	0.00000	0.00003
23	3	0.00001	0.00044	0.00000	0.00000	0.00000	0.00000
24	3	-0.00049	0.00000	0.00000	0.00000	0.00000	-0.00003
25	3	-0.00103	-0.00025	0.00000	0.00000	0.00000	-0.00008
26	3	-0.00208	-0.00212	0.00000	0.00000	0.00000	-0.00018
27	3	-0.00398	-0.00544	0.00000	0.00000	0.00000	-0.00022
28	3	-0.00614	-0.00835	0.00000	0.00000	0.00000	-0.00009
29	3	-0.00632	-0.00778	0.00000	0.00000	0.00000	0.00033
30	3	0.00000	0.00000	0.00000	0.00000	0.00000	0.00114
31	3	0.01881	0.02063	0.00000	0.00000	0.00000	0.00147
32	3	0.03442	0.03510	0.00000	0.00000	0.00000	0.00072
33	3	0.03556	0.03896	0.00000	0.00000	0.00000	-0.00036
34	3	0.02056	0.03581	0.00000	0.00000	0.00000	-0.00106
35	3	0.00000	0.03273	0.00000	0.00000	0.00000	-0.00065
36	3	-0.00132	0.03501	0.00000	0.00000	0.00000	-0.00001
37	3	-0.00038	0.03755	0.00000	0.00000	0.00000	-0.00004
38	3	-0.00275	0.04058	0.00000	0.00000	0.00000	-0.00003
39	3	0.00000	0.04293	0.00000	0.00000	0.00000	0.00092
40	3	0.03127	0.03613	0.00000	0.00000	0.00000	0.00123
41	3	0.04403	0.03386	0.00000	0.00000	0.00000	-0.00060
42	3	0.01594	0.05656	0.00000	0.00000	0.00000	-0.00335
43	3	0.00000	0.07027	0.00000	0.00000	0.00000	-0.00418

SUPPORT REACTIONS -UNIT KIP FEET STRUCTURE TYPE = PLANE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
3	3	2.93	0.00	0.00	0.00	0.00	0.00
7	3	18.36	0.00	0.00	0.00	0.00	0.00
11	3	14.40	0.00	0.00	0.00	0.00	0.00
35	3	-14.45	0.00	0.00	0.00	0.00	0.00
39	3	-18.37	0.00	0.00	0.00	0.00	0.00
43	3	-2.90	0.00	0.00	0.00	0.00	0.00
22	3	0.00	-1.24	0.00	0.00	0.00	0.00
24	3	0.00	-1.24	0.00	0.00	0.00	0.00
16	3	-9.36	-23.84	0.00	0.00	0.00	0.00
30	3	9.39	-23.84	0.00	0.00	0.00	0.00

MEMBER END FORCES STRUCTURE TYPE = PLANE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
3	3	3	32.20	1.64	0.00	0.00	0.00	-14.67
		4	-32.18	-1.63	0.00	0.00	0.00	15.41
4	3	4	32.20	-1.13	0.00	0.00	0.00	-15.41
		5	-32.14	1.17	0.00	0.00	0.00	13.62
5	3	5	31.74	-5.20	0.00	0.00	0.00	-13.62
		6	-31.67	5.24	0.00	0.00	0.00	5.45
6	3	6	30.78	-9.10	0.00	0.00	0.00	-5.45
		7	-30.71	9.13	0.00	0.00	0.00	-8.79
7	3	7	25.71	4.89	0.00	0.00	0.00	8.79
		8	-25.63	-4.88	0.00	0.00	0.00	-1.13
8	3	8	26.05	1.55	0.00	0.00	0.00	1.13
		9	-25.97	-1.55	0.00	0.00	0.00	1.30
9	3	9	25.97	1.64	0.00	0.00	0.00	1.30
		10	-25.90	-1.64	0.00	0.00	0.00	0.94
10	3	10	25.56	4.47	0.00	0.00	0.00	-0.94
		11	-25.50	-4.46	0.00	0.00	0.00	7.05
11	3	11	28.79	-6.71	0.00	0.00	0.00	-7.05
		12	-28.73	6.73	0.00	0.00	0.00	-2.10
12	3	12	29.34	-3.16	0.00	0.00	0.00	2.10
		13	-29.27	3.19	0.00	0.00	0.00	-6.44
13	3	13	29.45	-0.20	0.00	0.00	0.00	6.44
		14	-29.39	0.23	0.00	0.00	0.00	-6.73
14	3	14	29.22	3.13	0.00	0.00	0.00	6.73
		15	-29.17	-3.09	0.00	0.00	0.00	-2.47
15	3	15	28.59	6.53	0.00	0.00	0.00	2.47
		16	-28.54	-6.49	0.00	0.00	0.00	6.38
16	3	16	4.81	-2.01	0.00	0.00	0.00	-6.38
		17	-4.77	2.06	0.00	0.00	0.00	3.60
17	3	17	4.97	-1.52	0.00	0.00	0.00	-3.60
		18	-4.93	1.58	0.00	0.00	0.00	1.49
18	3	18	5.08	-1.00	0.00	0.00	0.00	-1.49
		19	-5.04	1.06	0.00	0.00	0.00	0.09

MEMBER END FORCES STRUCTURE TYPE = PLANE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
19	3	19	5.13	-0.49	0.00	0.00	0.00	-0.09
		20	-5.10	0.55	0.00	0.00	0.00	-0.62
20	3	20	5.13	0.01	0.00	0.00	0.00	0.62
		21	-5.12	0.06	0.00	0.00	0.00	-0.65
21	3	21	5.09	0.52	0.00	0.00	0.00	0.65
		22	-5.08	-0.45	0.00	0.00	0.00	0.01
22	3	22	4.92	-0.22	0.00	0.00	0.00	-0.01
		23	-4.92	0.29	0.00	0.00	0.00	-0.34
23	3	23	4.92	0.29	0.00	0.00	0.00	0.34
		24	-4.92	-0.22	0.00	0.00	0.00	0.01
24	3	24	5.08	-0.45	0.00	0.00	0.00	-0.01
		25	-5.09	0.52	0.00	0.00	0.00	-0.65
25	3	25	5.12	0.05	0.00	0.00	0.00	0.65
		26	-5.13	0.01	0.00	0.00	0.00	-0.62
26	3	26	5.11	0.53	0.00	0.00	0.00	0.62
		27	-5.13	-0.47	0.00	0.00	0.00	0.08
27	3	27	5.04	1.07	0.00	0.00	0.00	-0.08
		28	-5.07	-1.01	0.00	0.00	0.00	1.49
28	3	28	4.93	1.57	0.00	0.00	0.00	-1.49
		29	-4.97	-1.52	0.00	0.00	0.00	3.60
29	3	29	4.77	2.06	0.00	0.00	0.00	-3.60
		30	-4.82	-2.01	0.00	0.00	0.00	6.38
30	3	30	28.56	-6.46	0.00	0.00	0.00	-6.38
		31	-28.61	6.51	0.00	0.00	0.00	-2.44
31	3	31	29.18	-3.06	0.00	0.00	0.00	2.44
		32	-29.24	3.10	0.00	0.00	0.00	-6.66
32	3	32	29.40	0.07	0.00	0.00	0.00	6.66
		33	-29.46	-0.03	0.00	0.00	0.00	-6.60
33	3	33	29.26	3.41	0.00	0.00	0.00	6.60
		34	-29.32	-3.39	0.00	0.00	0.00	-1.96
34	3	34	28.78	6.56	0.00	0.00	0.00	1.96
		35	-28.85	-6.54	0.00	0.00	0.00	6.97
35	3	35	25.49	-4.47	0.00	0.00	0.00	-6.97
		36	-25.56	4.48	0.00	0.00	0.00	0.84

MEMBER END FORCES STRUCTURE TYPE = PLANE

ALL UNITS ARE -- KIP FEET

MEMB	LOAD	JT	AXIAL	SHEAR-Y	SHEAR-Z	TORSION	MOM-Y	MOM-Z
36	3	36	25.91	-1.46	0.00	0.00	0.00	-0.84
		37	-25.98	1.47	0.00	0.00	0.00	-1.16
37	3	37	25.97	-1.54	0.00	0.00	0.00	-1.16
		38	-26.05	1.54	0.00	0.00	0.00	-1.25
38	3	38	25.64	-4.86	0.00	0.00	0.00	1.25
		39	-25.71	4.88	0.00	0.00	0.00	-8.89
39	3	39	30.66	9.33	0.00	0.00	0.00	8.89
		40	-30.73	-9.31	0.00	0.00	0.00	5.64
40	3	40	31.68	5.26	0.00	0.00	0.00	-5.64
		41	-31.75	-5.22	0.00	0.00	0.00	13.85
41	3	41	32.16	1.01	0.00	0.00	0.00	-13.85
		42	-32.22	-0.97	0.00	0.00	0.00	15.40
42	3	42	32.20	-1.61	0.00	0.00	0.00	-15.40
		43	-32.21	1.62	0.00	0.00	0.00	14.67

***** END OF LATEST ANALYSIS RESULT *****

56. CHECK CODE ALL

STAAD-III CODE CHECKING - (AISC)

ALL UNITS ARE - KIP FEET (UNLESS OTHERWISE NOTED)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
=====					
3	ST W6X 20	PASS	AISC- H1-2	0.837	3
		32.18 C	0.00	15.41	0.46
4	ST W6X 20	PASS	AISC- H1-2	0.837	3
		32.20 C	0.00	-15.41	0.00
5	ST W6X 20	PASS	AISC- H1-2	0.765	3
		31.74 C	0.00	-13.62	0.00
6	ST W6X 20	PASS	AISC- H1-2	0.575	3
		30.71 C	0.00	-8.79	1.56
7	ST W6X 20	PASS	AISC- H1-2	0.535	3
		25.71 C	0.00	8.79	0.00
8	ST W6X 20	PASS	AISC- H1-2	0.254	3
		25.97 C	0.00	1.30	1.56
9	ST W6X 20	PASS	AISC- H1-2	0.254	3
		25.97 C	0.00	1.30	0.00
10	ST W6X 20	PASS	AISC- H1-2	0.468	3
		25.50 C	0.00	7.05	1.37
11	ST W6X 20	PASS	AISC- H1-2	0.494	3
		28.79 C	0.00	-7.05	0.00
12	ST W6X 20	PASS	AISC- H1-2	0.474	3
		29.27 C	0.00	-6.44	1.37
13	ST W6X 20	PASS	AISC- H1-2	0.486	3
		29.39 C	0.00	-6.73	1.36
14	ST W6X 20	PASS	AISC- H1-2	0.485	3
		29.22 C	0.00	6.73	0.00
15	ST W6X 20	PASS	AISC- H1-2	0.466	3
		28.54 C	0.00	6.38	1.36
16	ST W6X 20	PASS	AISC- H1-3	0.280	3
		4.81 C	0.00	-6.38	0.00
17	ST W6X 20	PASS	AISC- H1-3	0.176	3
		4.97 C	0.00	-3.60	0.00
18	ST W6X 20	PASS	AISC- H1-3	0.097	3
		5.08 C	0.00	-1.49	0.00
19	ST W6X 20	PASS	AISC- H1-3	0.065	3
		5.10 C	0.00	-0.62	1.36
20	ST W6X 20	PASS	AISC- H1-3	0.066	3
		5.12 C	0.00	-0.65	1.36
21	ST W6X 20	PASS	AISC- H1-3	0.066	3
		5.09 C	0.00	0.65	0.00
22	ST W6X 20	PASS	AISC- H1-3	0.052	3
		4.92 C	0.00	-0.34	1.37
23	ST W6X 20	PASS	AISC- H1-3	0.052	3
		4.92 C	0.00	0.34	0.00
24	ST W6X 20	PASS	AISC- H1-3	0.066	3
		5.09 C	0.00	-0.65	1.36
25	ST W6X 20	PASS	AISC- H1-3	0.066	3
		5.12 C	0.00	0.65	0.00
26	ST W6X 20	PASS	AISC- H1-3	0.065	3
		5.11 C	0.00	0.62	0.00

ALL UNITS ARE - KIP FEET (UNLESS OTHERWISE NOTED)

MEMBER	TABLE	RESULT/ FX	CRITICAL COND/ MY	RATIO/ MZ	LOADING/ LOCATION
=====					
27	ST W6X 20	PASS	AISC- H1-3	0.097	3
		5.07 C	0.00	1.49	1.36
28	ST W6X 20	PASS	AISC- H1-3	0.176	3
		4.97 C	0.00	3.60	1.36
29	ST W6X 20	PASS	AISC- H1-3	0.280	3
		4.82 C	0.00	6.38	1.37
30	ST W6X 20	PASS	AISC- H1-2	0.466	3
		28.56	0.00	-6.38	0.00
31	ST W6X 20	PASS	AISC- H1-2	0.483	3
		29.24 C	0.00	-6.66	1.37
32	ST W6X 20	PASS	AISC- H1-2	0.484	3
		29.40 C	0.00	6.66	0.00
33	ST W6X 20	PASS	AISC- H1-2	0.480	3
		29.26 C	0.00	6.60	0.00
34	ST W6X 20	PASS	AISC- H1-2	0.491	3
		28.85 C	0.00	6.97	1.36
35	ST W6X 20	PASS	AISC- H1-2	0.465	3
		25.49 C	0.00	-6.97	0.00
36	ST W6X 20	PASS	AISC- H1-2	0.249	3
		25.98 C	0.00	-1.16	1.36
37	ST W6X 20	PASS	AISC- H1-2	0.253	3
		26.05 C	0.00	-1.25	1.56
38	ST W6X 20	PASS	AISC- H1-2	0.539	3
		25.71 C	0.00	-8.89	1.57
39	ST W6X 20	PASS	AISC- H1-2	0.578	3
		30.66 C	0.00	8.89	0.00
40	ST W6X 20	PASS	AISC- H1-2	0.774	3
		31.75 C	0.00	13.85	1.57
41	ST W6X 20	PASS	AISC- H1-2	0.837	3
		32.22 C	0.00	15.40	1.57
42	ST W6X 20	PASS	AISC- H1-2	0.836	3
		32.20 C	0.00	-15.40	0.00

***** END OF TABULATED RESULT OF DESIGN *****

57. PLOT DISPLACEMENT FILE

58. PLOT BENDING FILE

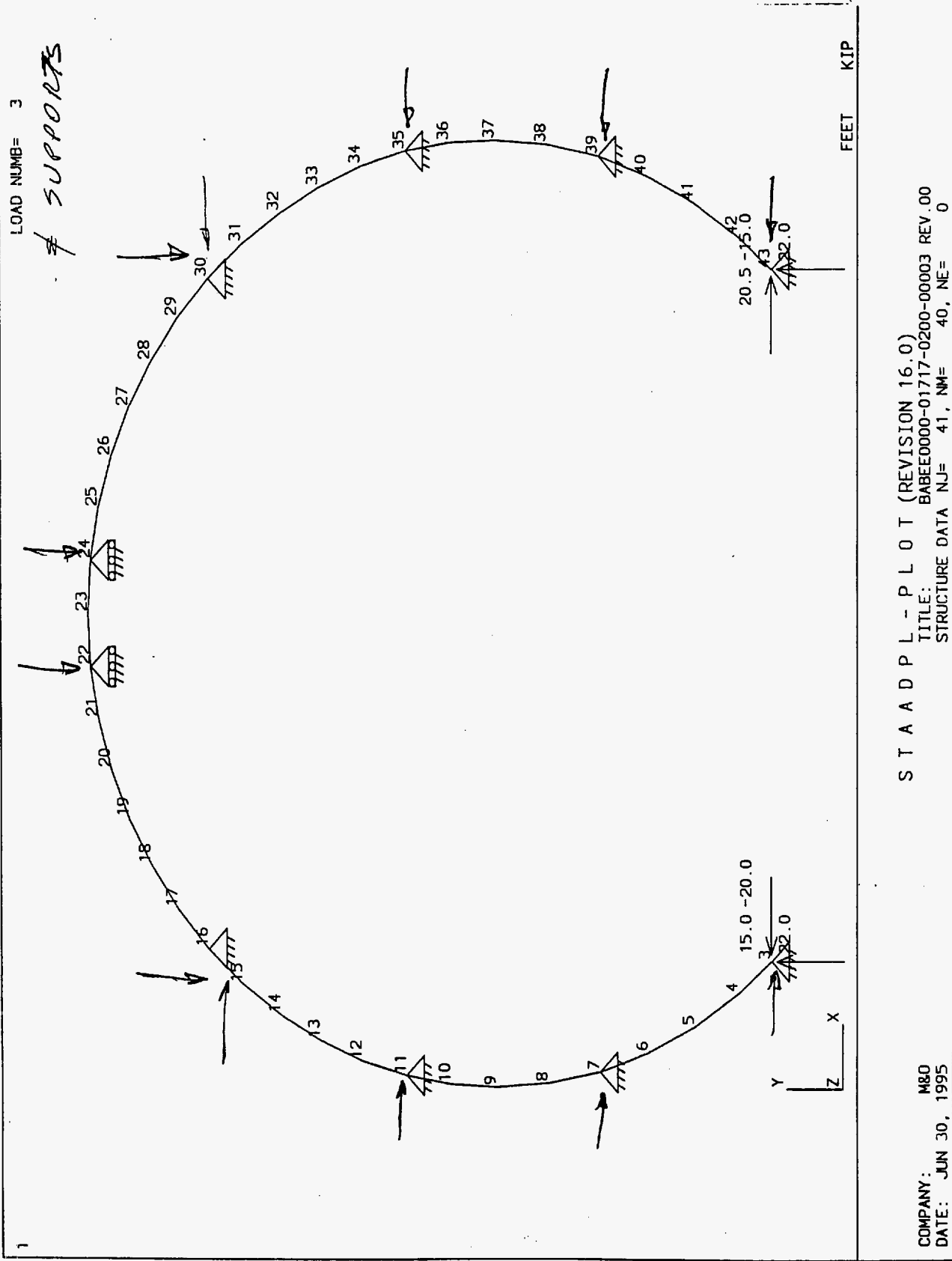
59. FINISH

***** END OF STAAD-III *****

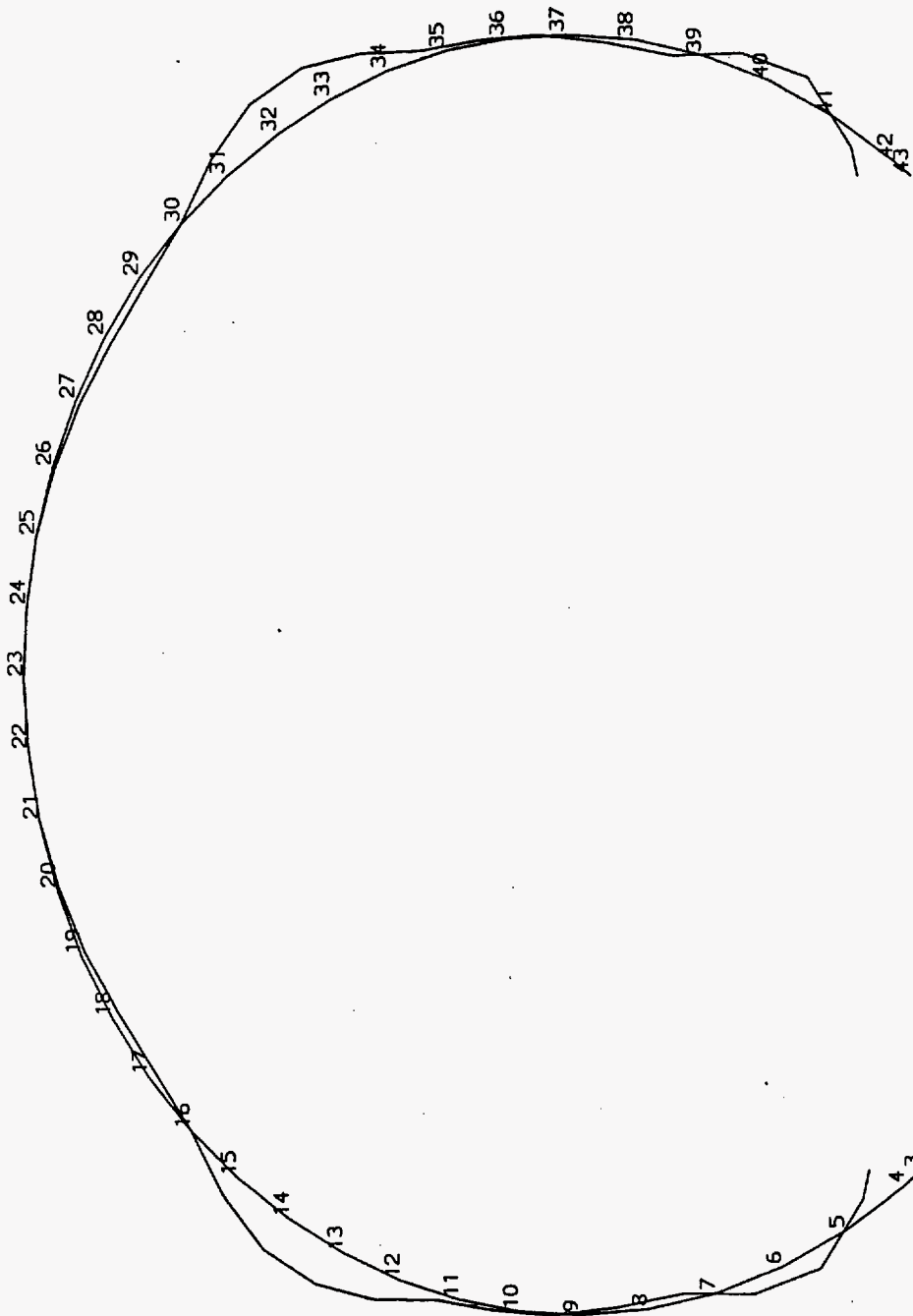
DATE= SEP 11,1995 TIME= 13:57:46 *****

For questions on STAAD-III/ISDS, contact: *

RESEARCH ENGINEERS, Inc at (714) 974-2500 *



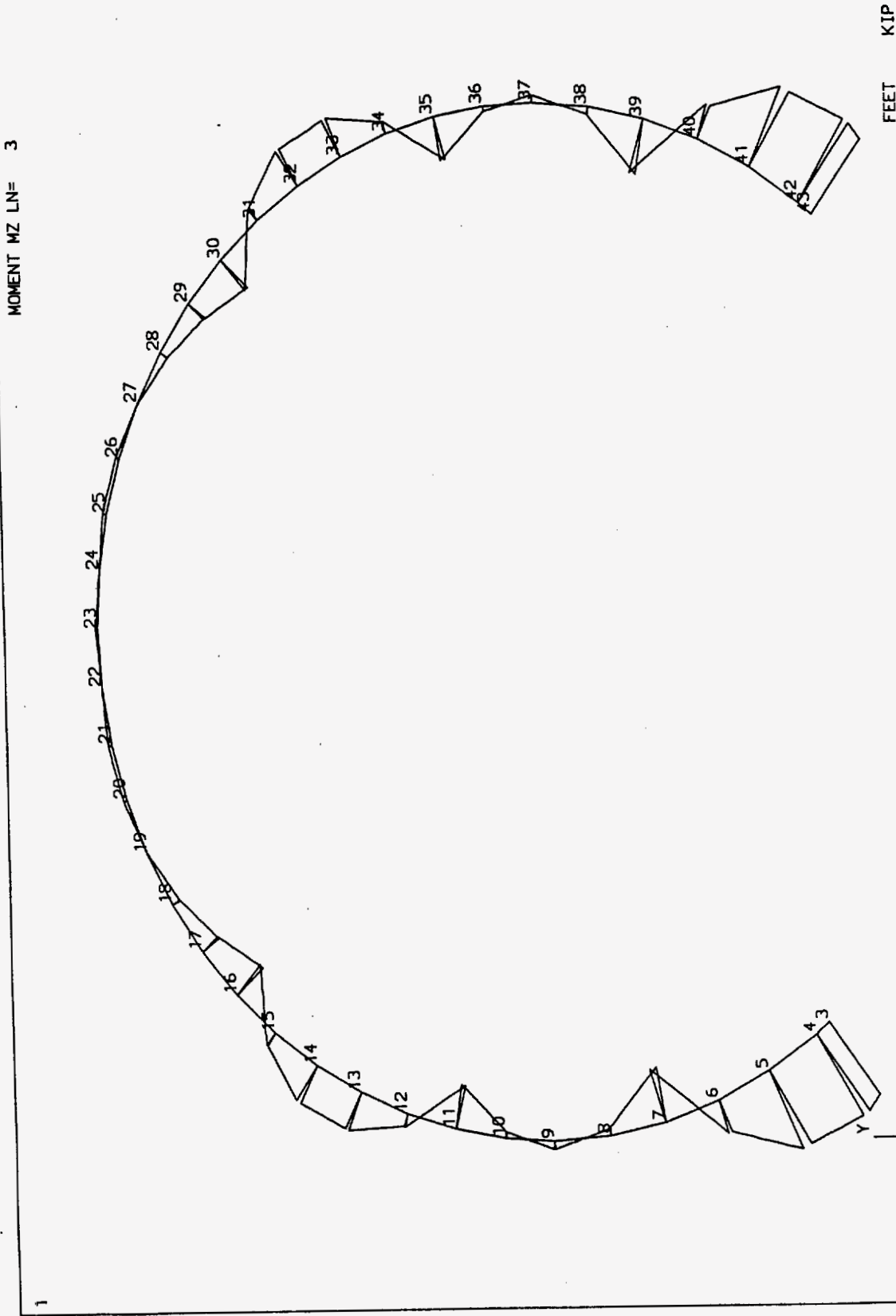
DFDR LOAD= 3



FEET KIP

STADPL - PLOT (REVISION 16.0)
 TITLE: BABEE0000-01717-0200-00003 ATTACHMENT VIII
 STRUCTURE DATA NJ= 41, NM= 40, NE= 0

COMPANY: M80
 DATE: SEP 11, 1995



STADPL - PLOT (REVISION 16.0)
 TITLE: BABEE0000-01717-0200-00003 ATTACHMENT VIII
 STRUCTURE DATA NJ= 41, NM= 40, NE= 0

COMPANY: M80
 DATE: SEP 11, 1995

SUMMARY OF COMPUTER ANALYSES FOR W6X20 STEEL SHAPE

Analysis No.	LOAD	SCOPE	INTERACTION COEFFICIENT		MEMBER	CONCLUSIONS
			Computer	Hand calc's		
1. STLRV3 20 TONS	20 TON JACK	) )Determine)W6X20)Jack	0.964	1.038	3,4,41,42	W6X20 is not adequate for 20 T jack
2. STLRV3 17 TONS	17 TON JACK	)capacity)	0.837	0.898	3,4,41,42	W6X20 is adequate for 17 T jack

TITLE: ESF Ground Support - Structural Steel Analysis

ATTACHMENT VIII
DI: BABEE0000-01717-0200-00003 REV 02
Page: VIII-26 of VIII-27

ATTACHMENT VIII

CONCLUSIONS

The conclusions of the analyses performed in attachment VIII are:

1. The W6X20 steel shape is adequate for a 17 Ton jacking force, but not for a 20 Ton jacking force.

ATTACHMENT IX — SUMMARY OF DESIGN SKETCHESGENERAL NOTES :

(1) ALL MATERIALS USED IN ENGINEERING CALCULATIONS FOR ESF GROUND SUPPORT — STRUCTURAL STEEL ANALYSIS AND DESIGN ARE BASED ON THE FOLLOWING UNLESS NOTED OTHERWISE :

ITEM	DESIGNATION	CRITICAL MATERIAL CHARACTERISTIC (MINIMUM)
a. STRUCTURAL STEEL SHAPE AND PLATE	ASTM A36	58 ^{ksi} MINIMUM TENSILE STRENGTH
b. BOLTS, STUDS AND TIE RODS	ASTM A307	58 ^{ksi} MINIMUM TENSILE STRENGTH
NUTS	ASTM A563	175 ^{ksi} MINIMUM PROOF LOAD STRESS
WASHERS	ASTM F436	HARDNESS 33 TO 45 HRC MINIMUM
c. STRUCTURAL PIPE	ASTM A53 GRADE B	60 ^{ksi} MINIMUM TENSILE STRENGTH
d. WELDING	AWS A5.1 E70XX	70 ^{ksi} MINIMUM TENSILE STRENGTH
e. SHIM PLATE	ASTM A36	58 ^{ksi} MINIMUM TENSILE STRENGTH
f. CONCRETE		$f'_c = 5000$ PSI

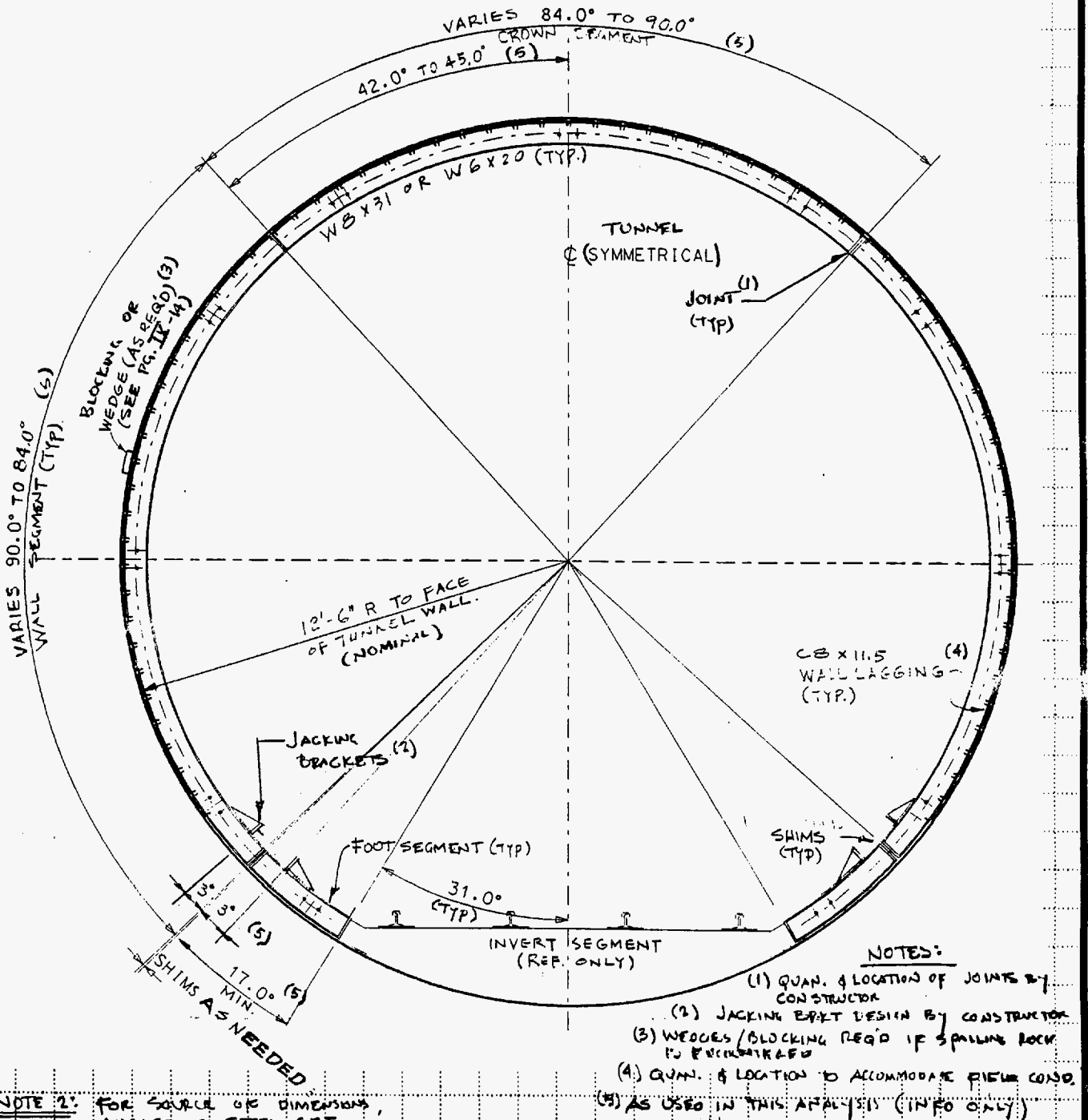
(2) THE DESIGN SKETCHES CONTAINED IN THIS ATTACHMENT ARE THE ESF GROUND SUPPORT STRUCTURAL STEEL SET SUMMARY INCLUDING SUPPORT COMPONENTS AND CONNECTION DETAILS.

THE CONFIGURATION OF THE STEEL SET, THE LENGTH OF THE SUBTENDED ARC, THE JACKING LOCATION, AND DETAILS MAY BE MODIFIED BY THE CONSTRUCTOR TO FACILITATE THE STEEL SET FABRICATION, ASSEMBLY AND ERECTION.

THE CONSTRUCTOR SHALL SUBMIT ALL MODIFICATIONS, IF ANY, FOR A/E REVIEW AND APPROVAL. HOWEVER, THE FOLLOWING ITEMS ARE NOT SUBJECT TO MODIFICATION:

- a. STRUCTURAL STEEL SHAPES FOR STEEL SETS AND LAGGING.
- b. NOMINAL TUNNEL DIAMETER.
- c. STEEL SET SPACING.
- d. INVERT SEGMENT FOUNDATION CURB CONFIGURATION.

(3) CONNECTIONS FOR UTILITY SUPPORT BRACKET TO STEEL SET SHALL BE BOLTED AND THE BOLT HOLES IN STEEL SET SHALL BE FIELD DRILLED.

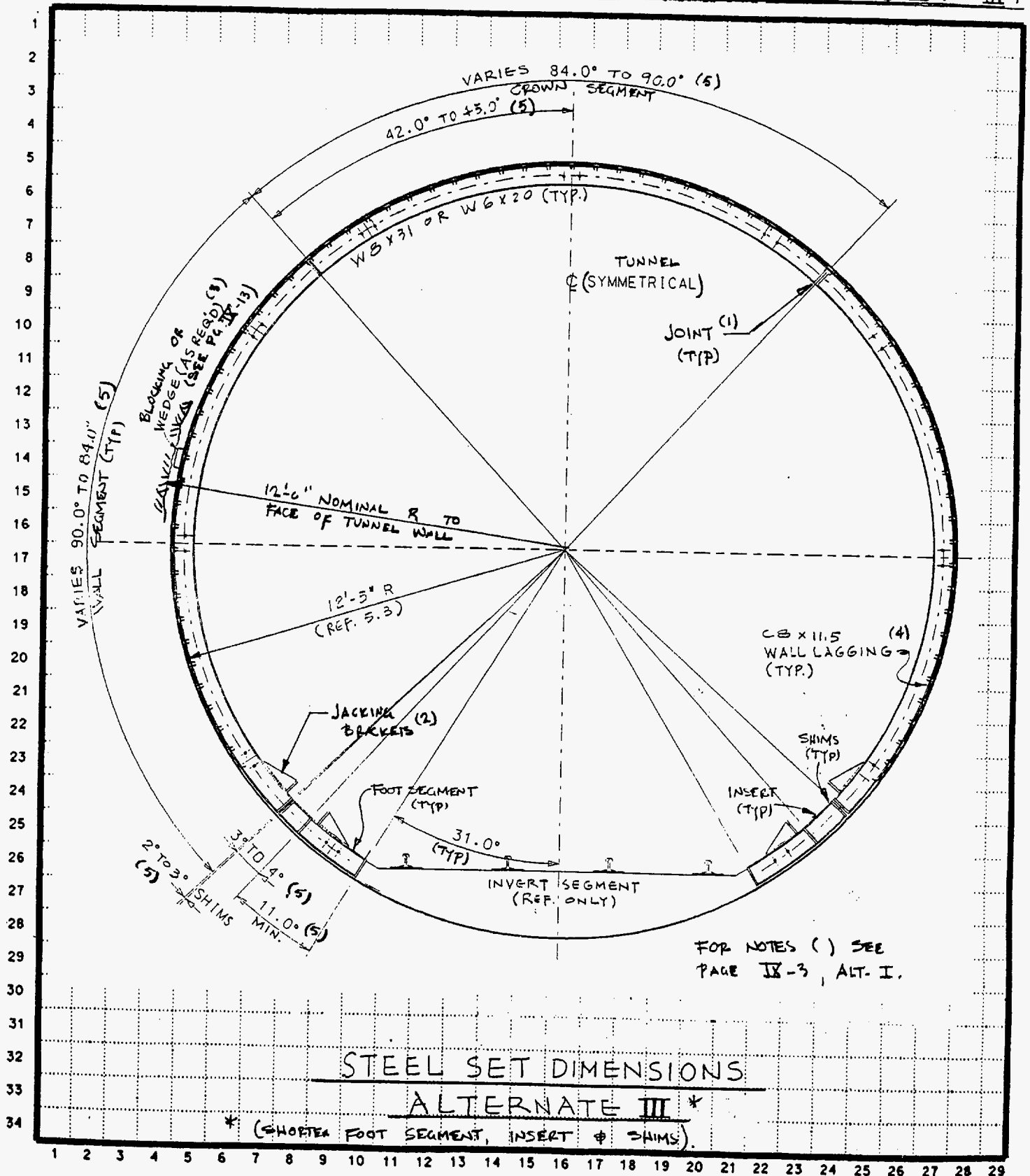


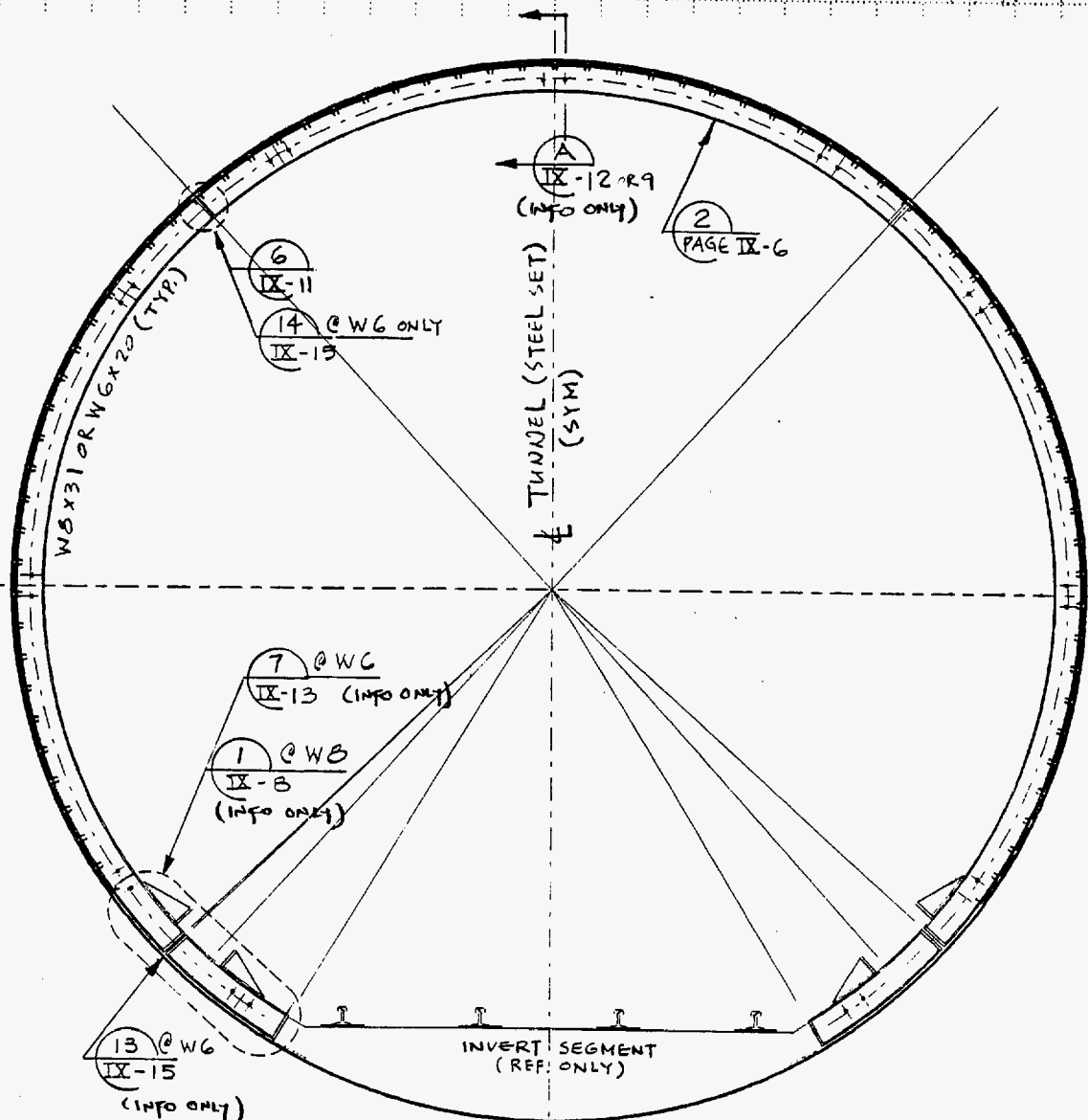
NOTE 2: FOR SOURCE OF DIMENSIONS, ANGLES & STEEL SET CONFIGURATION SEE SECTION 4.1.4, THIS ANALYSIS.

STEEL SET DIMENSIONS

ALTERNATE I *

* (LONGER FOOT SEGMENT & NO INSERT; SHIMS ONLY)

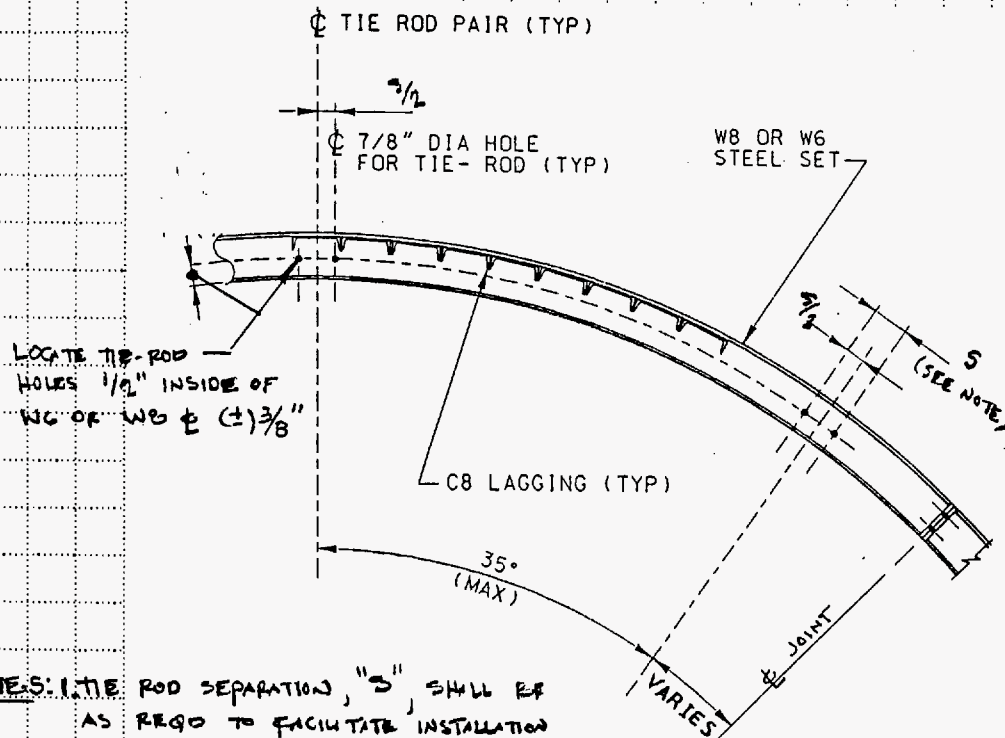




NOTE: " (INFO ONLY) " ITEMS ARE AS USED IN THIS ANALYSIS - MAY BE SUBJECT TO MODIFICATION BY CONSTRUCTOR WITH A/E APPROVAL (NON-CRITICAL ATTRIBUTES).

STEEL SET DETAIL

ALTERNATE I



- NOTES: 1. TIE ROD SEPARATION, "S", SHALL BE AS REQD TO FACILITATE INSTALLATION
2. TIE ROD PAIR TO BE LOCATED NO MORE THAN 7° FROM FOOT SEGMENT BASE PLATES.

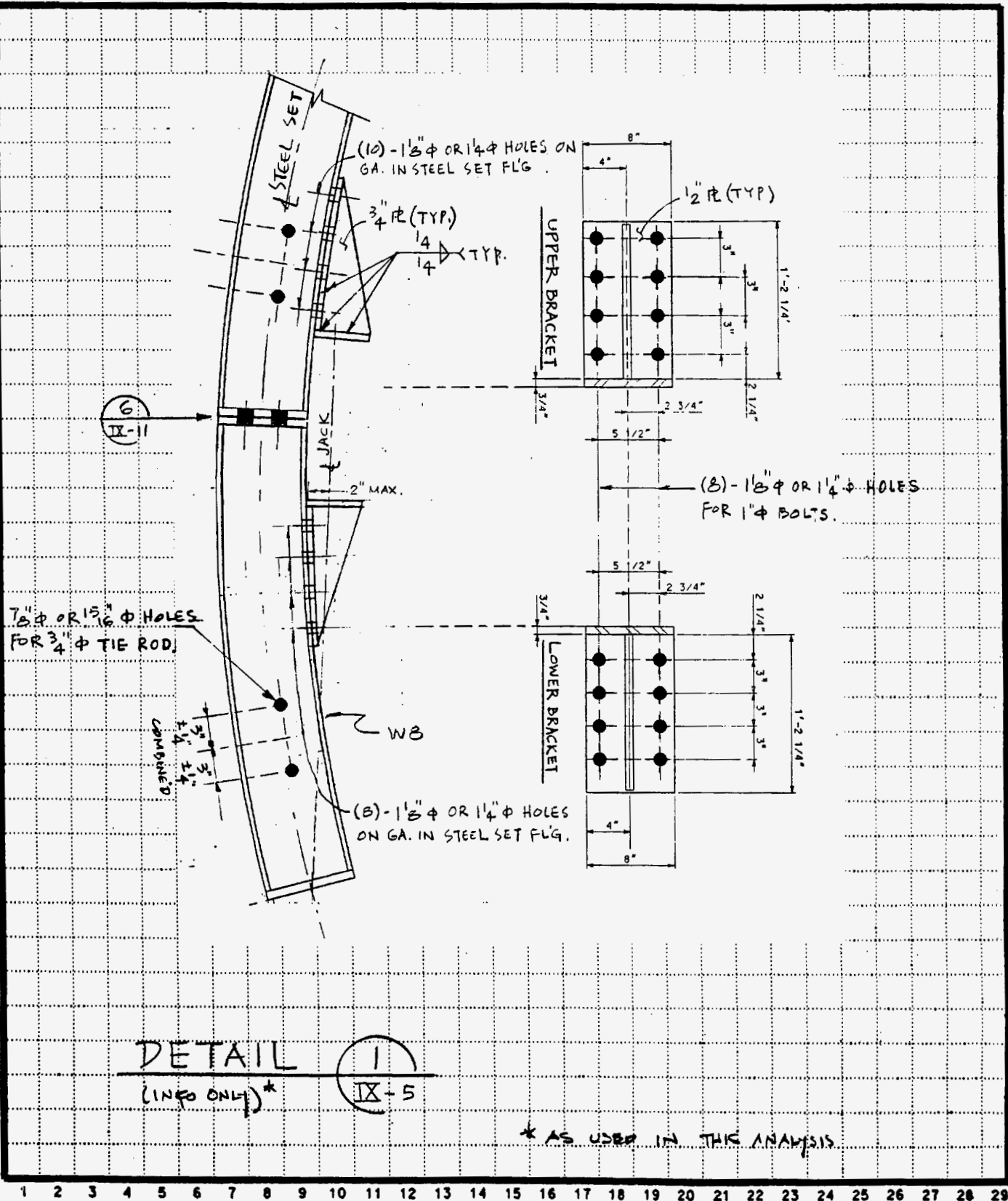
DETAIL

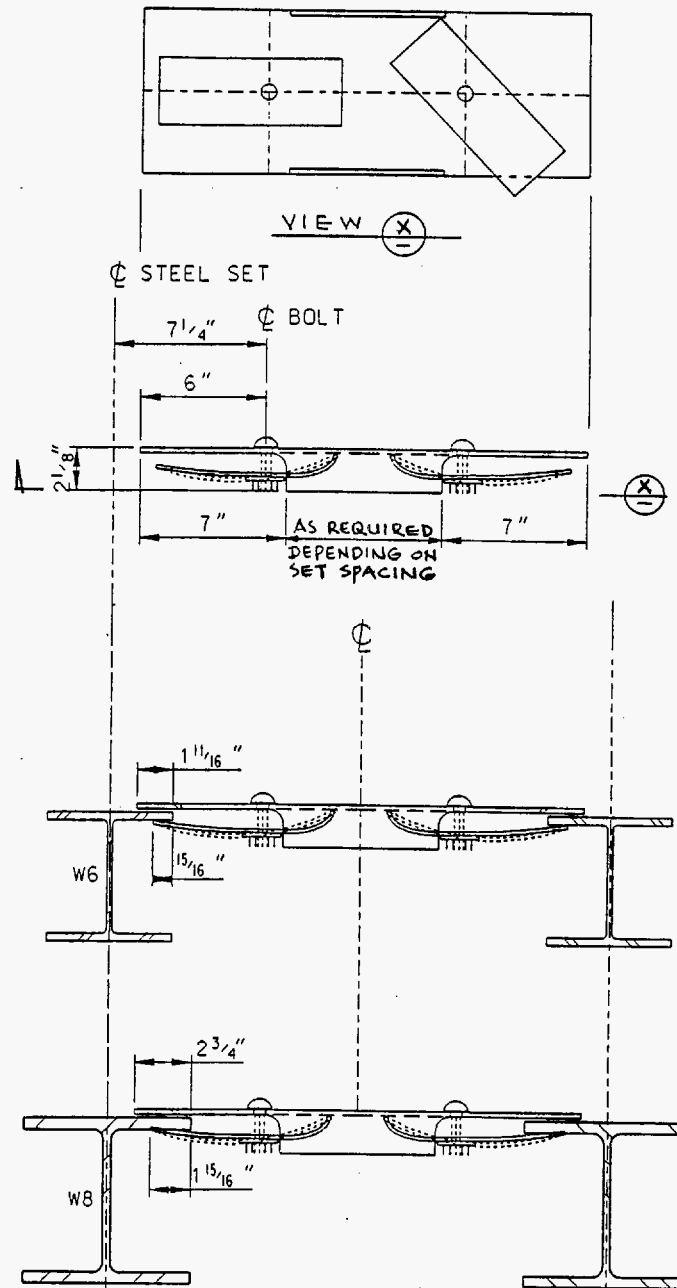
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2

PAGE IX-5 & IX-16

(NOT USED)





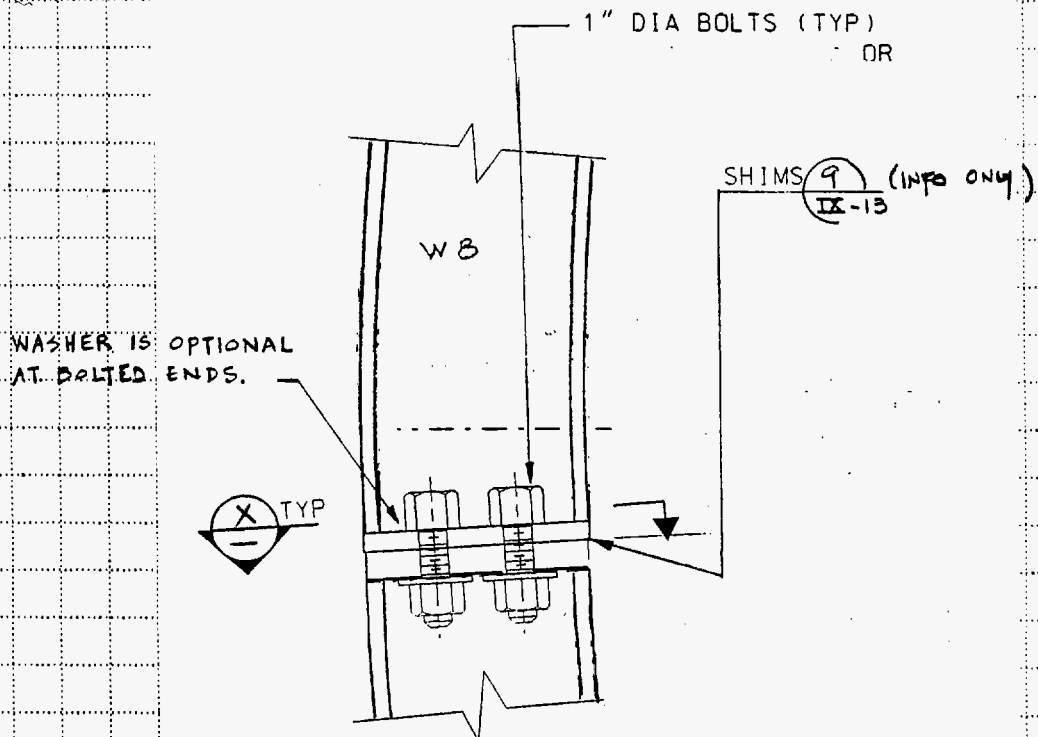
LAGGING CONFIGURATION USED IN THIS ANALYSIS.

SECTION A
(INFO ONLY)*

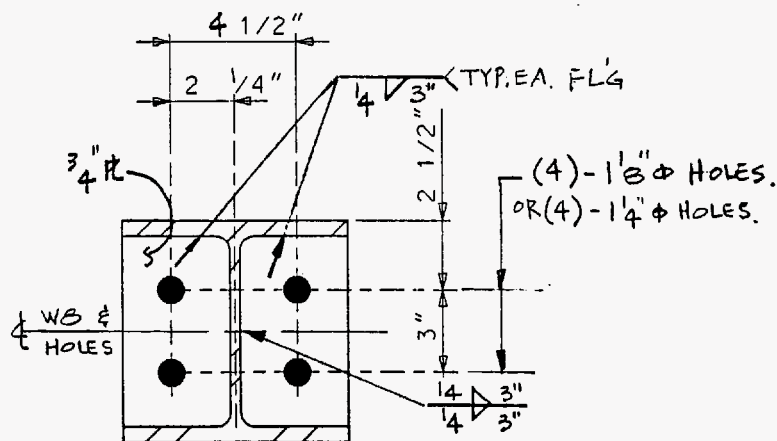
IX-5

* AS USED IN THIS ANALYSIS

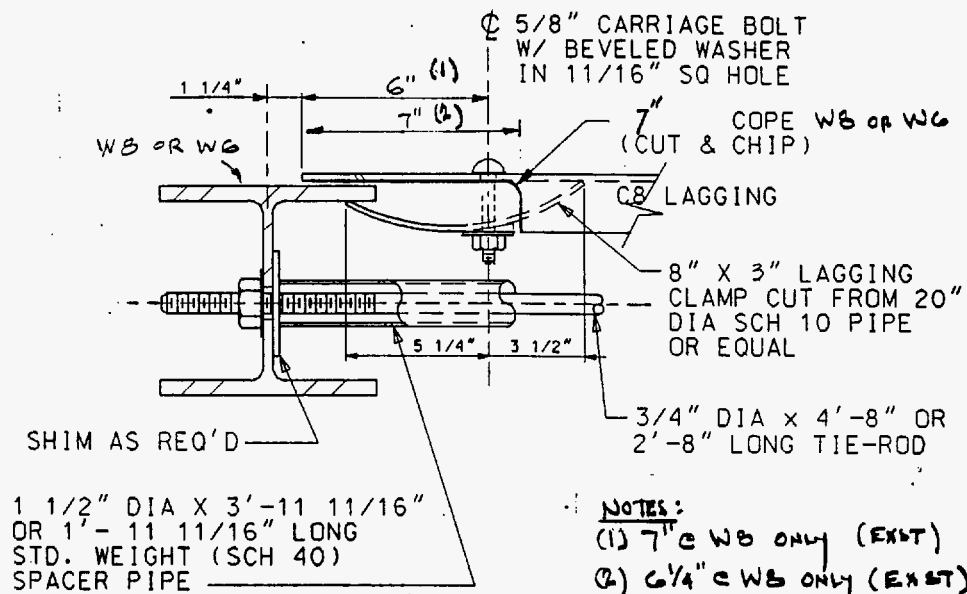
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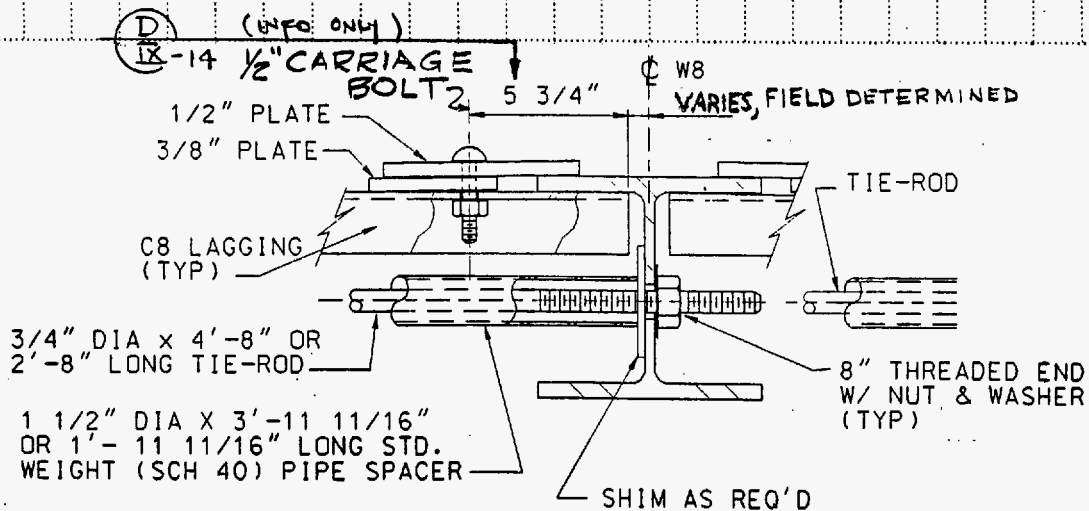
DETAIL G
IX-5 & 8



SECTION X



SECTION A LAGGING CLAMP, CARRIAGE BOLT, NUT AND WASHER ARE NON-Q ITEMS.
(INFO ONLY) IX-5 OPTION III



* DETAILS AS USED IN THIS ANALYSIS

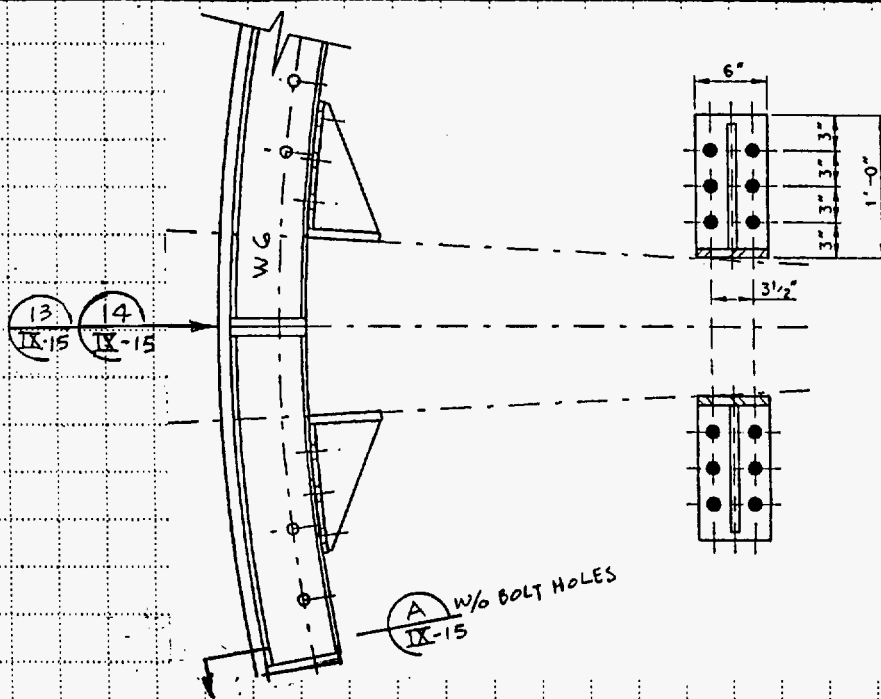
DETAIL 8 (FOR WB ONLY)
(INFO ONLY) - OPTION I

ATTACHMENT IX

DI: BABEE0000-01717-0200-00003 REV 02

TITLE: ESF Ground Support - Structural Steel Analysis

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UPPER
BRACKET

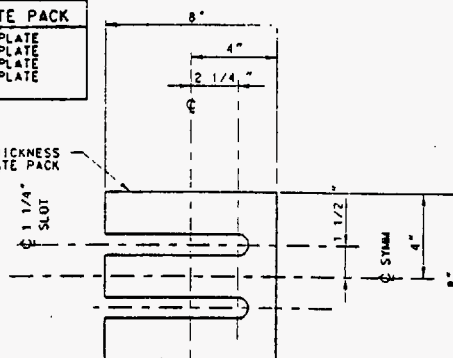
LOWER
BRACKET

NOTE: SAME DIMENSIONS FOR UPPER &
LOWER BRACKETS.
2. FOR INFORMATION NOT SHOWN
SEE DETAIL 1, PAGE IX-8

DETAIL 7
(INFO ONLY)* PAGE IX-5 & IX-17

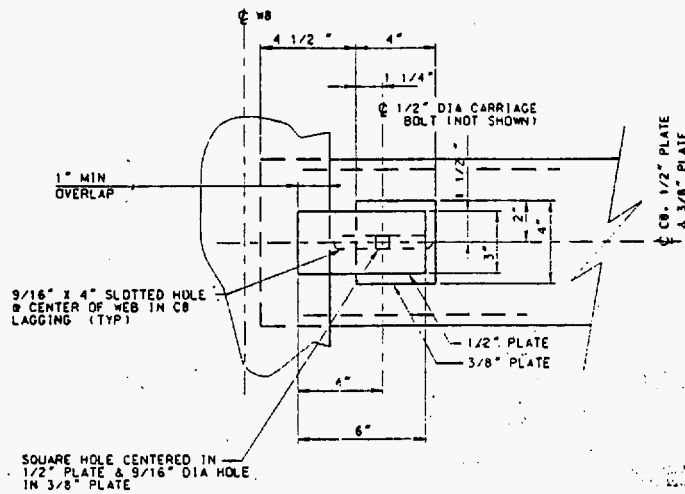
SHIM PLATE PACK	
2	EA 1/8" PLATE
2	EA 1/4" PLATE
1	EA 1/2" PLATE
1	EA 1" PLATE

FOR PLATE THICKNESS
SEE SHIM PLATE PACK



DETAIL 9
(INFO ONLY)* IX-11

* DETAILS AS USED IN THIS ANALYSIS ONLY



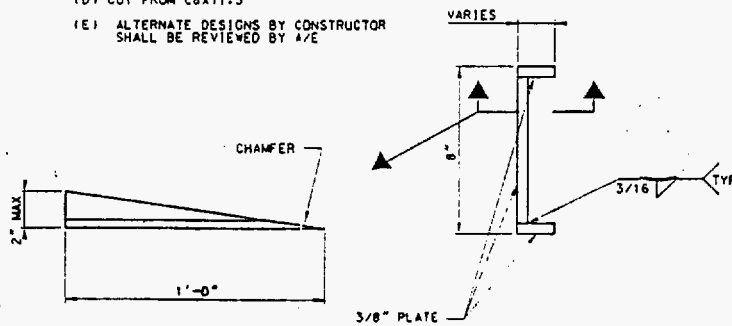
VIEW

SCALE: 3" = 1'-0"

(INFO ONLY)*

FABRICATION OF STEEL WEDGES SHALL BE
CONSTRUCTORS OPTION OF THE FOLLOWING:

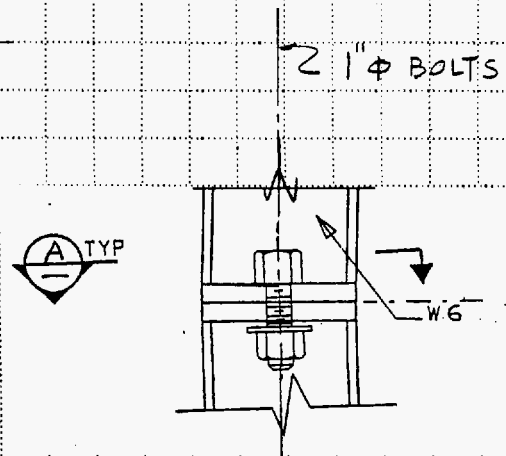
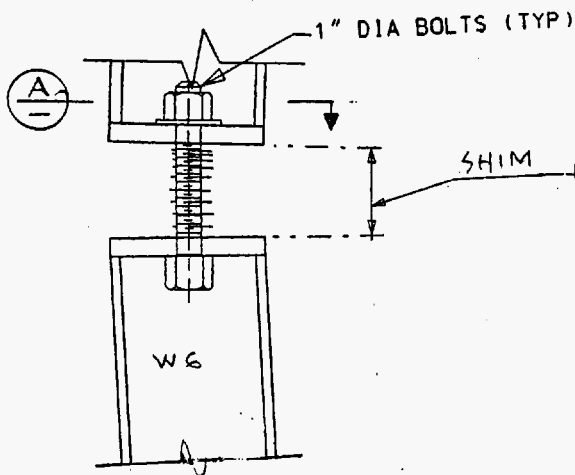
- (A) FABRICATE AS SHOWN ON THIS DETAIL.
- (B) CUT FROM TS 8x2x3/8 STRUCTURAL TUBING.
- (C) CUT & BEND 3/8" PLATE.
- (D) CUT FROM C8x11.5
- (E) ALTERNATE DESIGNS BY CONSTRUCTOR
SHALL BE REVIEWED BY A/E



WEDGE DETAIL

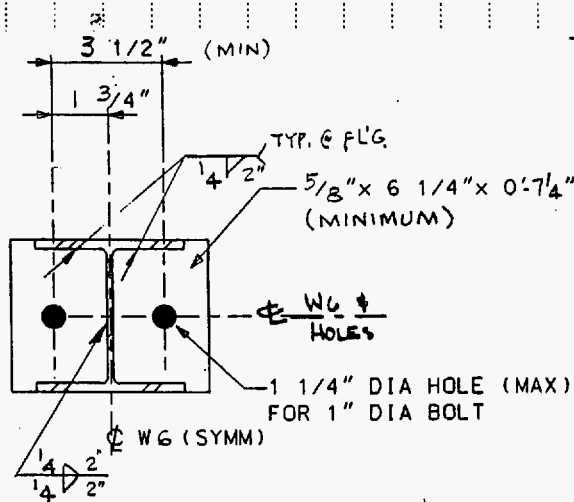
(INFO ONLY)*

* DETAILS AS USED IN THIS ANALYSIS ONLY.

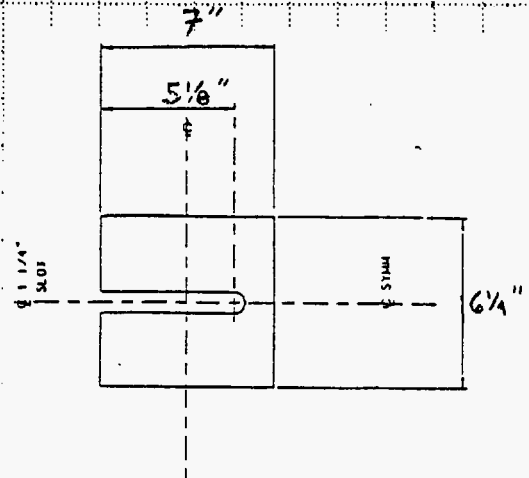


DETAIL 13
(INFO ONLY)* IX-5, IX-13

DETAIL 14
IX-5, IX-13



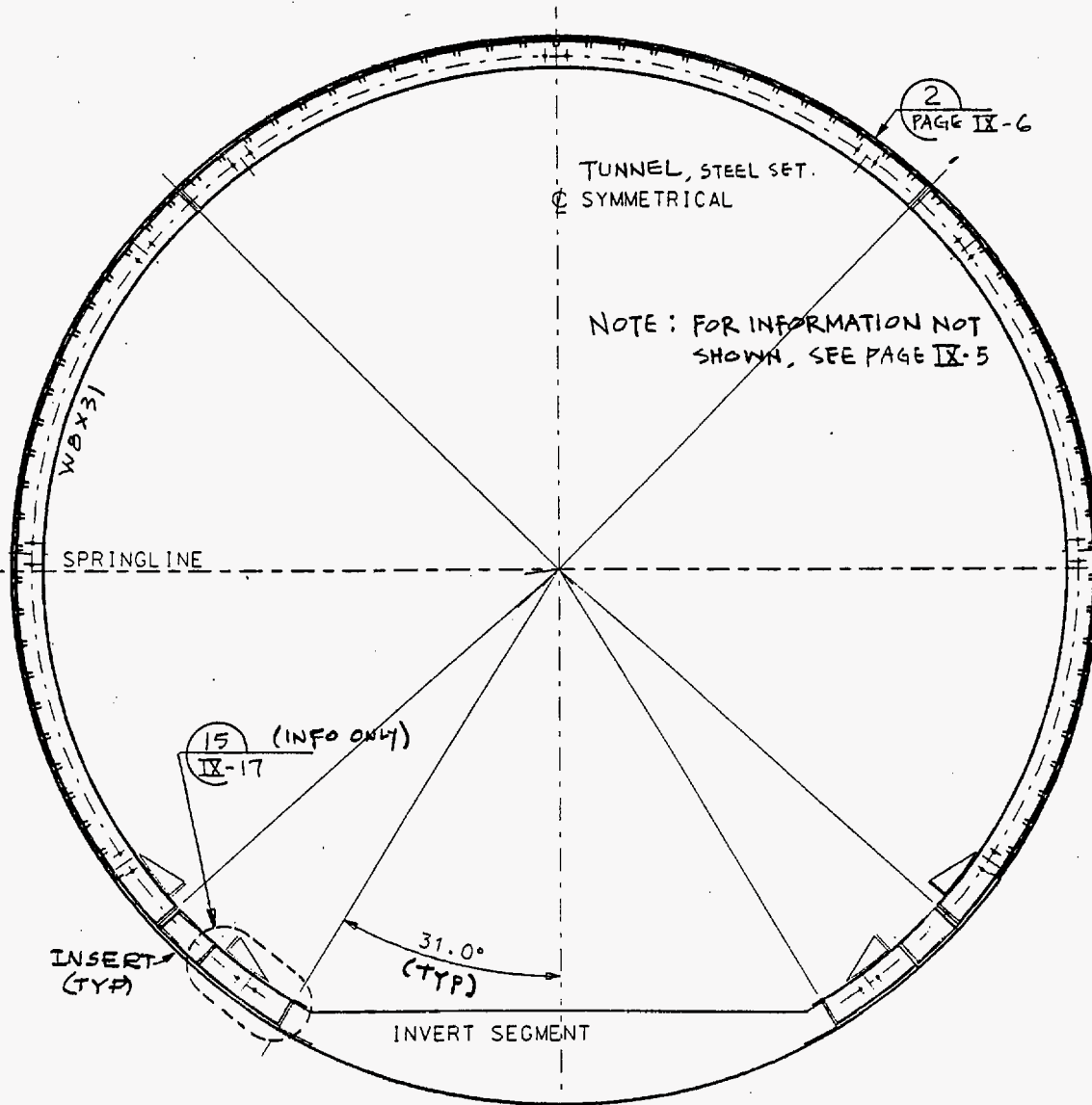
SECTION A
IX-13 (w/ Holes)

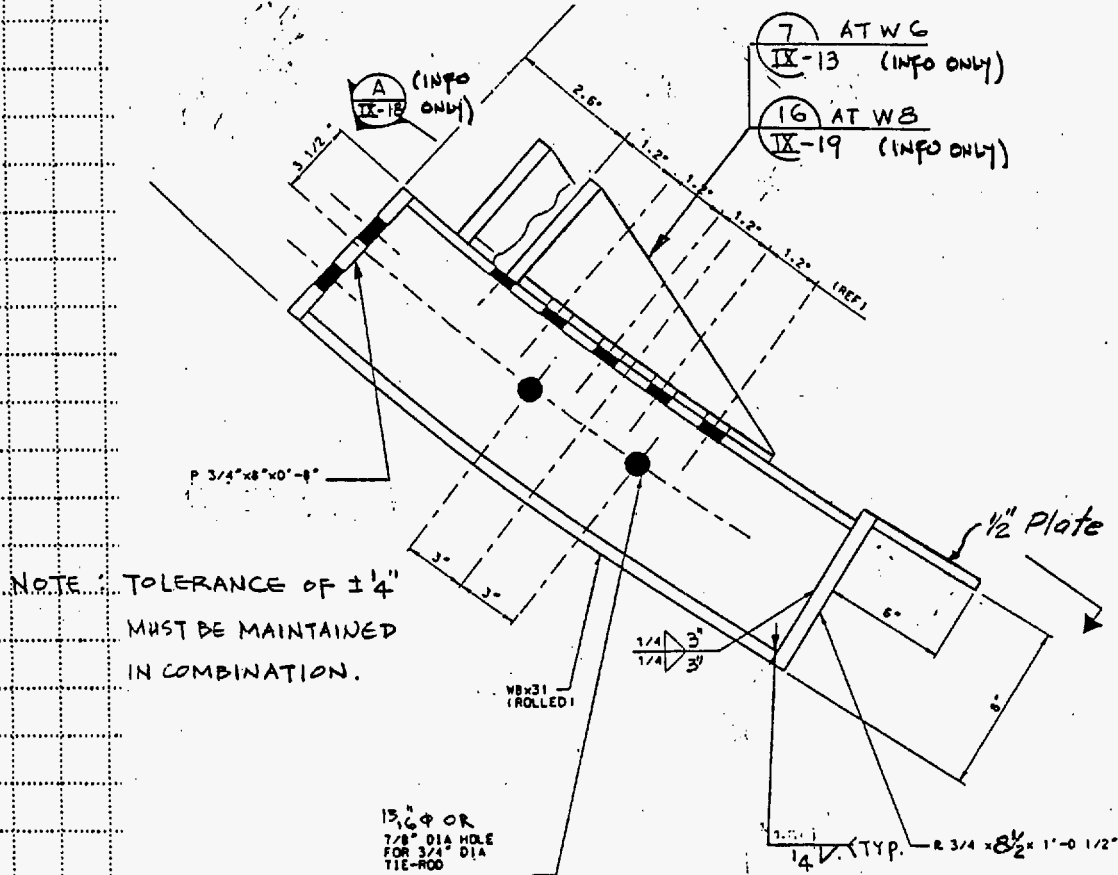


DETAIL 1
SCALE: NONE
(INFO ONLY)*

QUANTITY OF SHIM PACK AND PLATE THICKNESS IS CONSTRUCTORS OPTION

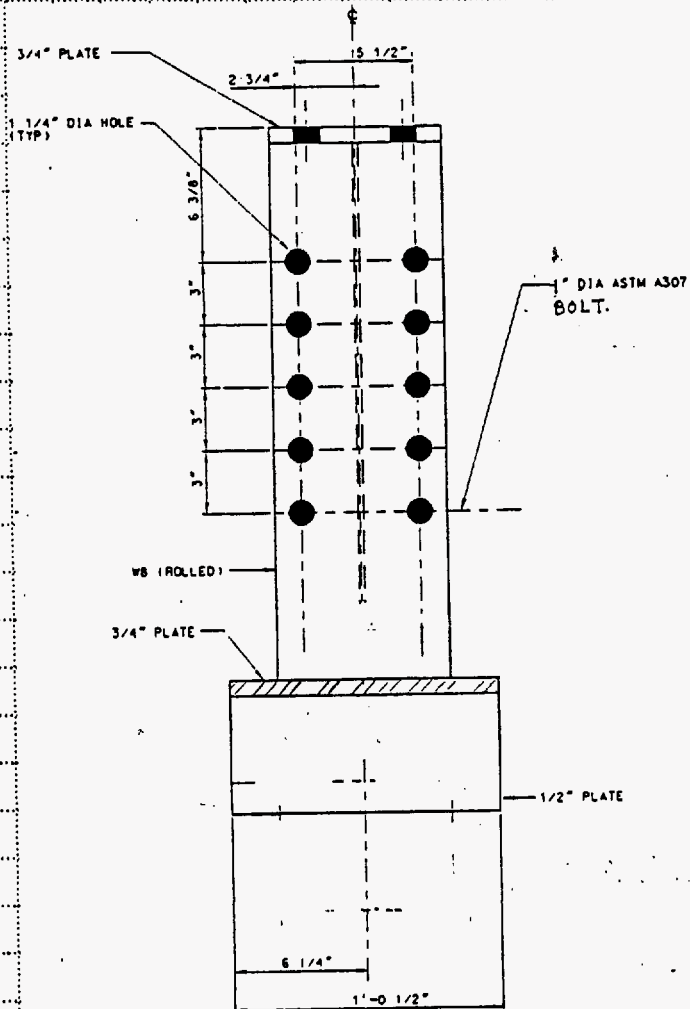
* DETAILS 1 & 13 AS USED IN THIS ANALYSIS ONLY

STEEL SET DETAILALTERNATE III



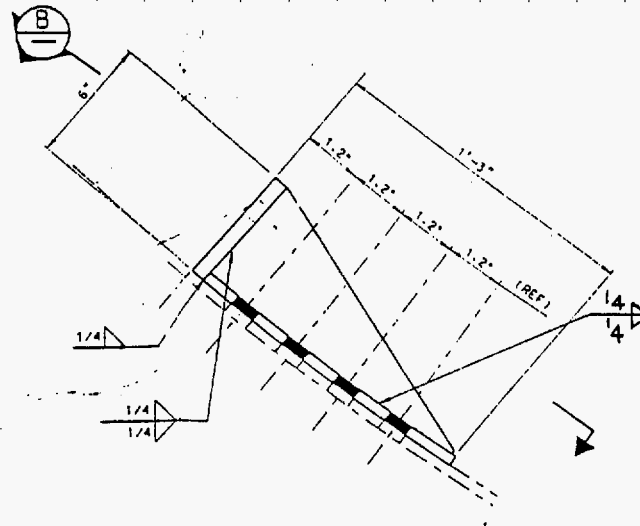
DETAIL (15)
(INFO ONLY)* IX-16

* DETAILS AS USED IN THIS ANALYSIS ONLY



VIEW A
(INFO ONLY)* IX-17

*DETAIL AS USED IN THIS ANALYSIS ONLY

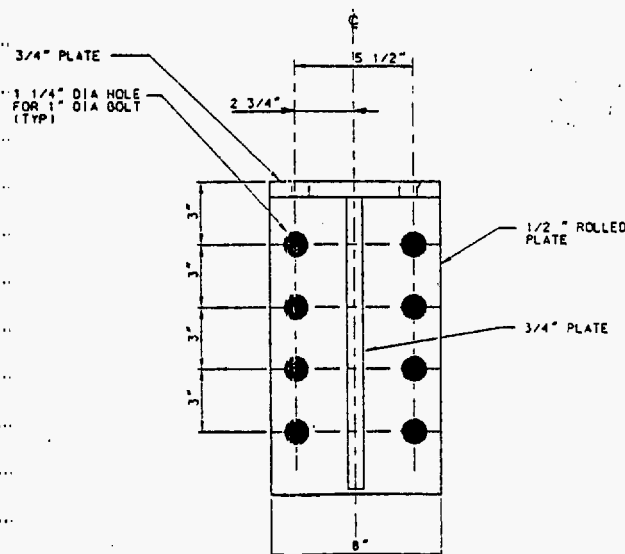


DETAIL

SCALE: 3" = 1'-0"

16
IX-172 BRACKETS EA RIB
(4 TOTAL) REQD

(INFO ONLY)*



VIEW

SCALE: 3" = 1'-0"

B
—

(INFO ONLY)*

* DETAILS AS USED IN THIS ANALYSIS ONLY

ATTACHMENT X

FINITE ELEMENT ANALYSIS FOR W8x31 BASE PLATE

Contents

Contents/Purpose/Design Data	X-1
Description	X-2
Analysis Methodology (Spring Approach)	X-2
Deviations from Normal Installation	X-3
Conclusions	X-4
Figure X.1	X-5
Node Numbering & Dimensions (Spring Model)	X-6
Element Numbering (Spring Model)	X-7
Loading & Fixed Node Configuration (Spring Model)	X-8
Stress Plot (K = 4000 kip/in) "PLATEZ"	X-9
Complete Analysis Results for "PLATEZ"	X-10

Purpose

The purpose of this finite element analysis of the W8x31 base plate is to determine if the stress developed in the plate under the following loading is less than the AISC allowable stress:

$$\text{Dead} + \text{Utility} + \text{Rock} + \text{Seismic Load (D+U+R+S)} = P_a = 121.8 \text{ kips (see Design Data).}$$

$$\begin{aligned} \text{The AISC Allowable Bending Stress} = F_b &= 0.75F_y = 0.75(36) \text{ (AISC pg 5-48, Eqn F2-1)} \\ &= 27 \text{ ksi} \times 1.333 \text{ (1/3 increase for seismic)} \\ &= 36 \text{ ksi.} \end{aligned}$$

The static load case of (D + U + R) is addressed in Attachment III, page III-65 of this analysis.

Design Data

Base plate dimensions: 12-1/2" x 3/4" x 0'-8" (Attachment III, pg III - 65)

W8x31 Properties (AISC M016, pg I - 32):

$$\begin{aligned} t_f &= 0.435" & b_f &= 7.995" & d &= 8.00" \\ t_w &= 0.285" & A &= 9.13" \end{aligned}$$

Design Axial Load on W8x31:

$$P_a = 121.8 \text{ kips (D+U+R+S, Attachment III, pg III - 108)}$$

Description

The 12-1/2" x 3/4" x 0'-8" base plate is supported by the invert segment curb which is 6-3/4" wide at the location of bearing contact with the base plate. The invert segment curb is 8" wide with a blockout for a seal on the side nearest the rock wall of 1/2" and a 3/4" chamfer on the interior side (see Figure X.1 on page X-5). The W8x31 steel set ring beam is welded to the base plate with 3" long fillet welds on the inside of the flanges and on both sides of the web (Attachment IX, page IX-11).

Analysis Methodology (Spring Approach)

Since the base plate is not fully supported by the invert curb, it cannot be analyzed by the conventional AISC methods (AISC M016, pg 3-106). The base plate is welded to the W8 at the flanges and at the web (see above); therefore, the plate is analyzed with only the welded portions of the flanges and web fixed to the plate at corresponding nodes (see Loading/Fixed Node Configuration, page X-8), with those same nodes free to deflect vertically (or with vertical springs depending on location). The base plate area in contact with the invert curb is modeled with vertical springs to represent the concrete support as described in the following paragraph.

To model the concrete support under the base plate, a spring element is placed at each node that is in contact with the concrete. A value of 4000 kip/in was chosen as a best estimate spring stiffness (constant) to represent the concrete based on the following, assuming the curb acts as a short column in compression:

$$\text{Average invert depth} = (6\text{-}3/4" \text{ @ curb \& } 24" \text{ @ center}) \text{ so assume } \approx 14"$$

$$\text{Assume } 12" \text{ wide} \times 14" \text{ deep column; Area} = A = (12")(14") = 168 \text{ in}^2$$

$$E = 57000 (f'_c)^{1/2} = 57000 (5000\text{psi})^{1/2} = 4030 \text{ ksi} \quad (\text{From ACI 318, Section 8.5})$$

$$L = \text{Length of column} = \text{arc length of invert} \approx [(2)(31.01^\circ)/360^\circ](25')(\pi) = 13.53 \text{ ft}$$

$$K = \text{stiffness} \approx AE/L = (168 \text{ in}^2)(4030 \text{ ksi})/(13.53\text{ft})(12\text{in/ft}) \\ = 4170 \text{ kip/in say} = 4000 \text{ kip/in}$$

Axial load from the W8 is applied as a pressure loading through the web and flanges of the W8 (see Loading/Fixed Joint Configuration, page X-8). The pressure loading is determined by dividing the total load (P_s) by the area the W8 member:

$$121.8 \text{ kip} / 9.13 \text{ in}^2 = 13.341 \text{ ksi}$$

However, since all the nodes do not have the same tributary area, it was necessary to factor the spring constant for the remaining nodes by multiplying the ratio of tributary areas by 4000 as shown in the following example for node number 73:

Approx. tributary area of greatest number of elements = $1.0185 \times 0.938 = 0.9554$

Tributary area of node 73 = $(1.126 + 0.80)/2 \times 0.938 = 0.9033$

Spring constant for node 73 = $4000 \times 0.9033 / 0.9554 = 3782 \approx 3800$ (rounded)

As shown above, the results were rounded for simplicity. In addition, nodes that occur at the corners and along the edges are further reduced by 1/4 and 1/2 respectively, as only 1/4 (corner) or 1/2 (edge) of the tributary area contributes at these nodes. Each node is also released in the x and y directions.

The resulting stress plot for the 4000 kip/in case shows a maximum stress contour of 29.54 ksi (pg X-9), with a maximum stress value of 33.23 ksi (elements 122 and 126, page X-27). The stress in the plate is below the allowable stress of 36 ksi; therefore, the plate is adequate for the governing (D+R+U+S) design load of 121.8 kips.

Deviations from Normal Installation

The base plate is designed for the normal condition of relatively uniform bearing on the invert segment curb as shown on Figure X.1. However, due to installation conditions, uneven bearing may occur, in which case the allowable stresses of the AISC and ACI codes might be exceeded as described below.

Prior to expanding the steel set, the foot segment is installed nominally perpendicular to the tunnel alignment and as close to the tunnel wall as practical with the base plate bearing flat on the invert segment curb. As jacking and expansion of the steel set occurs, the foot segment may rotate and move, creating uneven bearing on the invert curb. Rotation and movement of the foot segment during the jacking process may occur because of construction and/or erection conditions such as excavated tunnel shape (out-of-round), accumulation of tolerances, irregularities or voids in the tunnel walls, or other conditions that may affect the relative alignment of the steel set and concrete invert. When the foot segment base plate bears unevenly on the concrete invert curb or when the foot segment base plate is offset toward the tunnel centerline, the plate bearing area will decrease, increasing the bearing pressure on the concrete and the bending stress in the steel base plate. Bending of the steel base plate or localized spalling of the concrete curb might occur. However, excessive offset of the foot segment base plate towards the tunnel centerline is limited during the jacking/expansion process because if the base plate is offset excessively, the jacking force cannot be applied, i.e. there will be inadequate support for the base plate and the foot segment will rotate toward the centerline of the tunnel. The offset of the base plate should not exceed 1 inch at any location measured from the face of the curb to the inside face of the W8. This value was determined on page III-84 in Attachment III of this analysis.

Base plate and curb contact in the extreme case may occur initially through a single plate edge bearing on the concrete curb. To distribute the design load, this bearing condition might spall the contacted concrete in the localized bearing area until support is achieved through development of a satisfactory bearing area. In addition, the steel base plate might also deform and assist in developing a satisfactory bearing area. Provided the foot segment is properly positioned prior to jacking, localized spalling of the concrete invert curb or distortion of the base plate will not prohibit the steel set from performing its intended function of providing ground support in the ESF (invert arrangement will be modified and upgraded prior to incorporation into the repository).

Localized spalling of the concrete invert curb, obvious distortion of the base plate, or offset of the base plate exceeding 1 inch (page III-84) should be reported as nonconforming in accordance with Yucca Mountain Site Characterization Project Procedures so that the supports can be tracked for further manifestation of loading through ongoing monitoring programs. Reported nonconforming items will be evaluated according to specific conditions and dispositioned accordingly.

Conclusions

The 12-1/2" x 3/4" x 0'-8" plate is adequate for the design axial load applied.

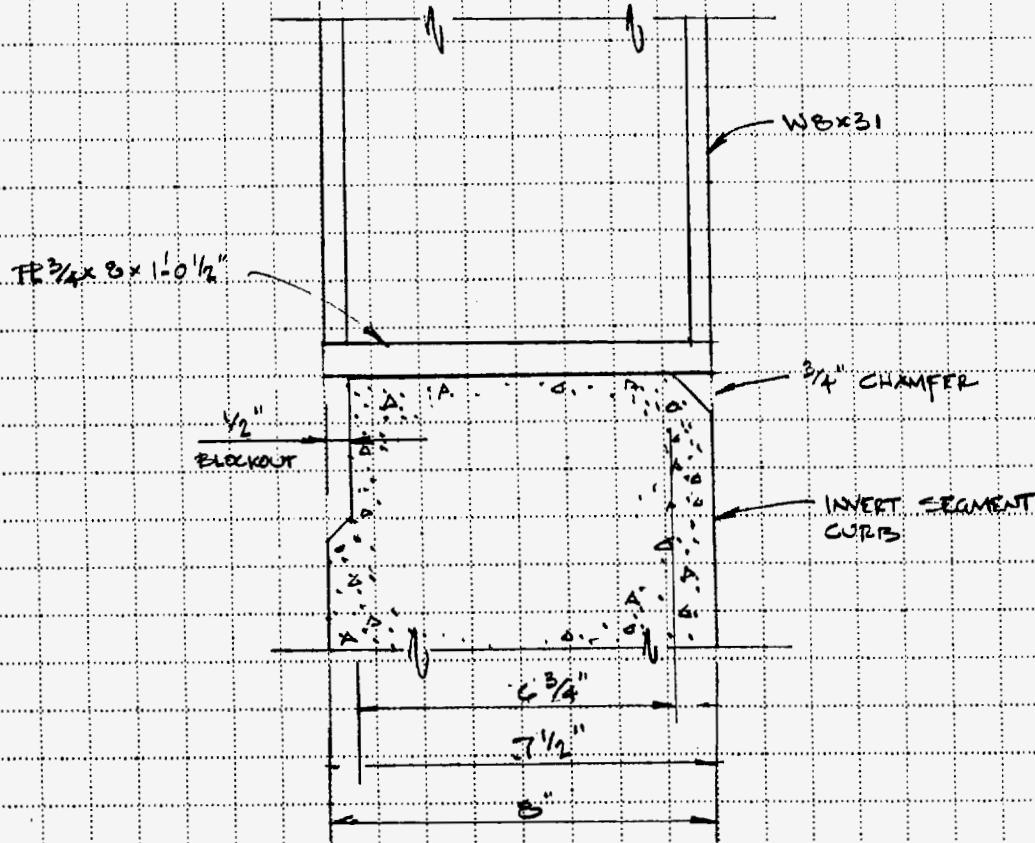
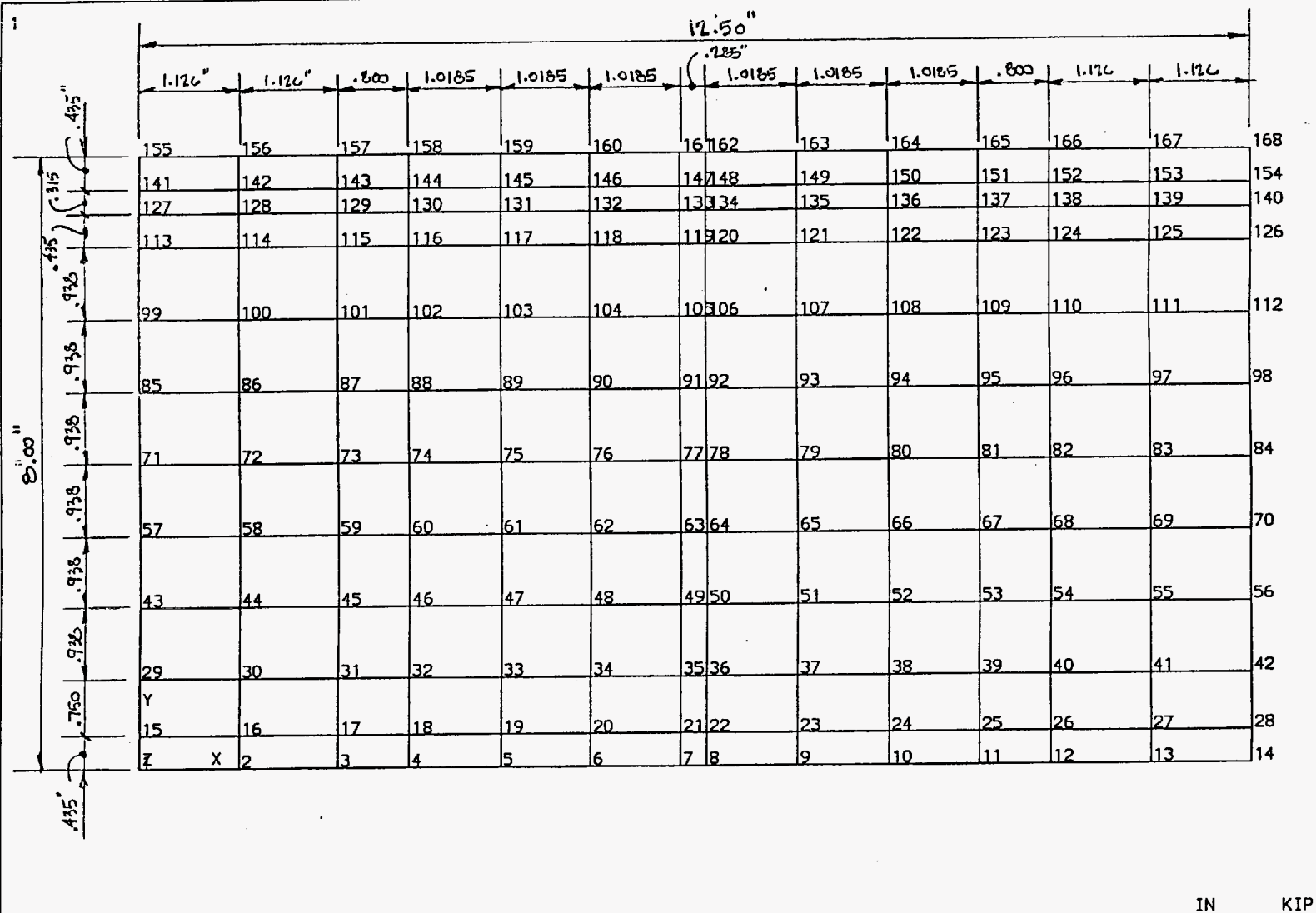


FIGURE X.1. WB & CURB INTERFACE.

NODE NUMBERING & DIMENSIONS - SPRING MODEL



STAAD PL - PLOT (REVISION 16.0)

COMPANY: M&O
DATE: MAY 2, 1996

TITLE: FINITE ELEMENT ANALYSIS FOR W8X31 BASEPL
STRUCTURE DATA NJ= 168, NM= 0, NE= 143

ELEMENT NUMBERING - SPRING MODEL

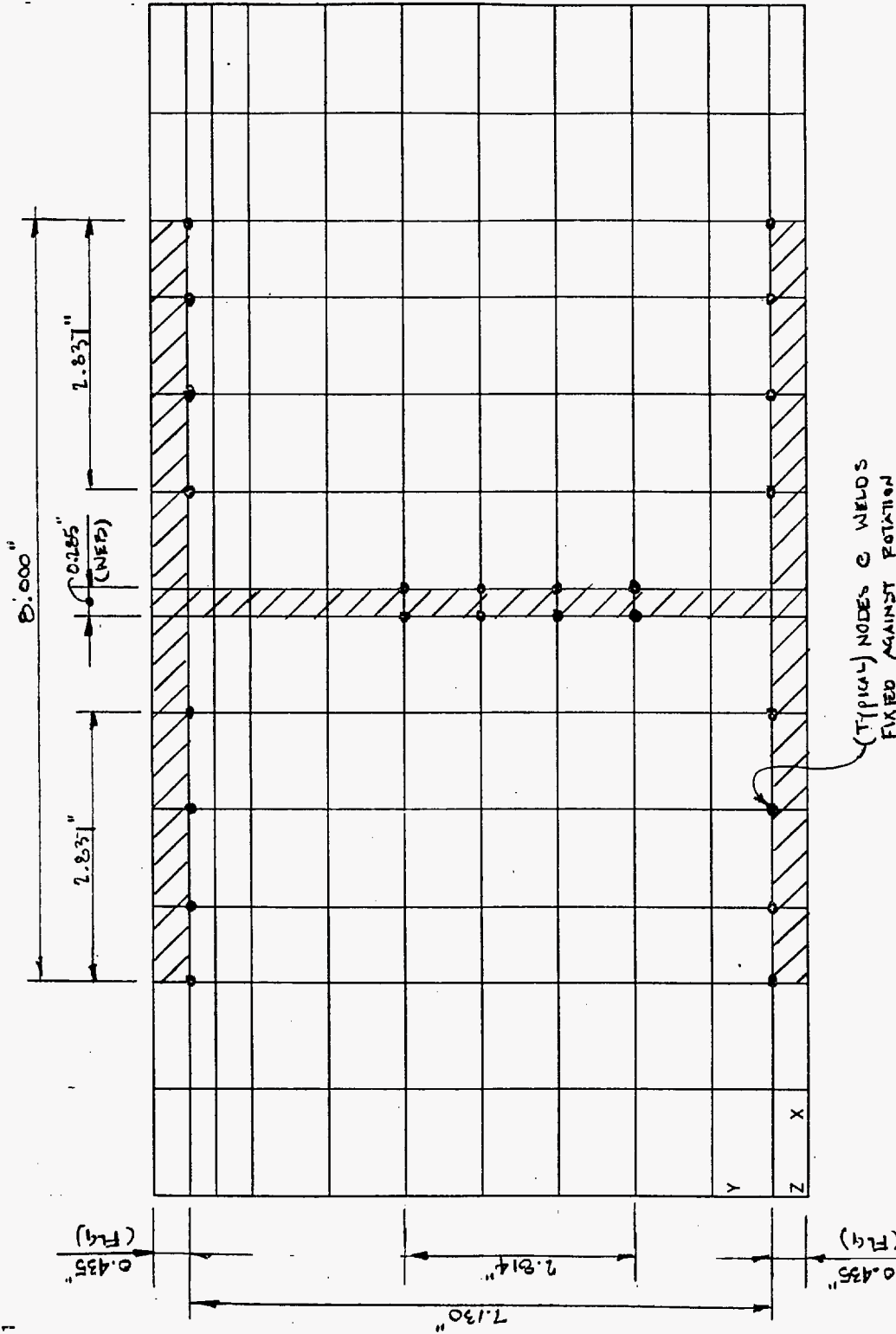
131	132	133	134	135	136	137	138	139	140	141	142	143
118	119	120	121	122	123	124	125	126	127	128	129	130
105	106	107	108	109	110	111	112	113	114	115	116	117
92	93	94	95	96	97	98	99	100	101	102	103	104
79	80	81	82	83	84	85	86	87	88	89	90	91
66	67	68	69	70	71	72	73	74	75	76	77	78
53	54	55	56	57	58	59	60	61	62	63	64	65
40	41	42	43	44	45	46	47	48	49	50	51	52
27	28	29	30	31	32	33	34	35	36	37	38	39
Y 14	15	16	17	18	19	20	21	22	23	24	25	26
Z 1 X	2	3	4	5	6	7	8	9	10	11	12	13

IN KIP

STADPL - PLOT (REVISION 16.0)

TITLE: FINITE ELEMENT ANALYSIS FOR W8X31 BASEPL
STRUCTURE DATA NJ= 168, NM= 0, NE= 143COMPANY: M&O
DATE: MAY 2, 1996

LOADING & FIXED NODE CONFIGURATION - SPRING MODEL



IN KIP

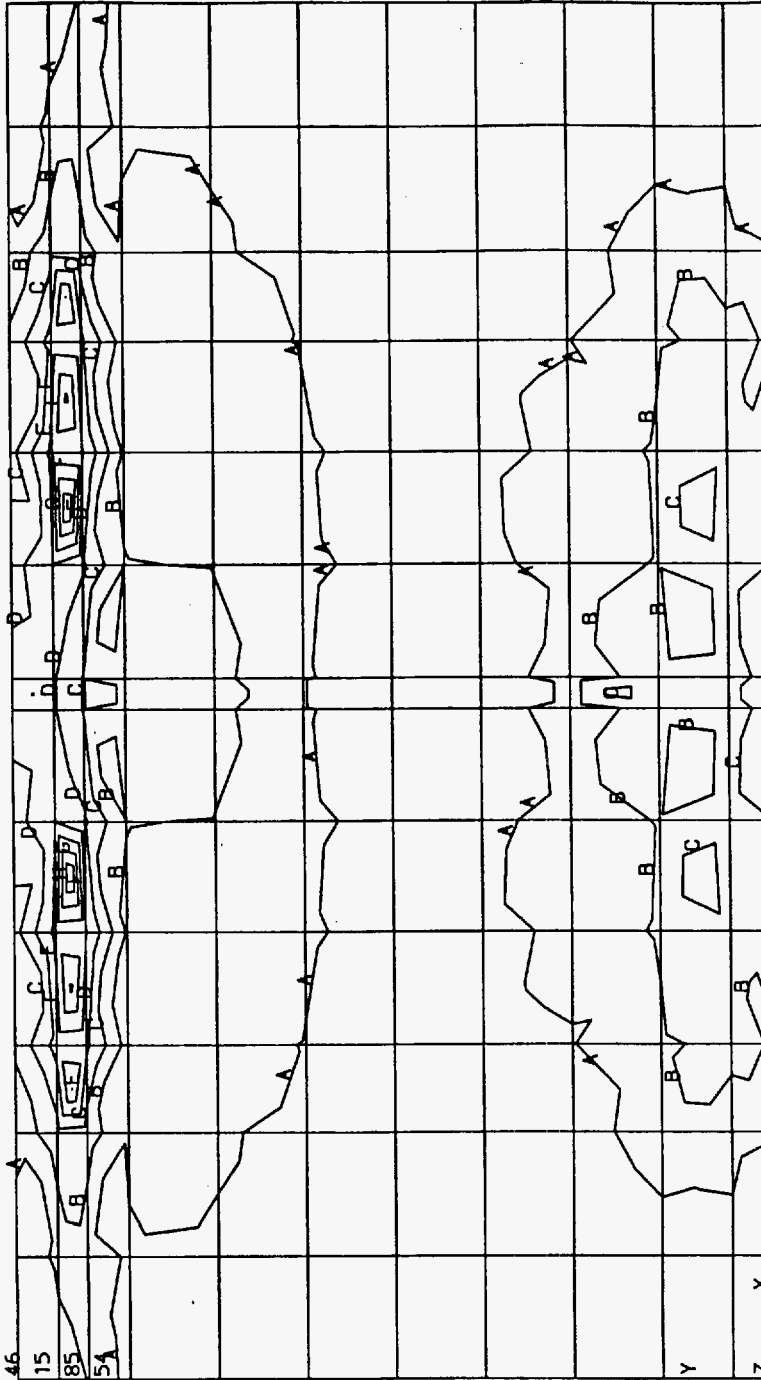
STADPL - PLOT (REVISION 16.0)
 TITLE: FINITE ELEMENT ANALYSIS FOR W8X31 BASEPL
 STRUCTURE DATA NJ= 168, NW= 0, NE= 143

COMPANY: M80
 DATE: JUN 18, 1996

STDR LOAD= 1

1 STRESS CONTOUR

- A 3.69
- B 7.38
- C 11.08
- D 14.77
- E 18.46
- F 22.15
- G 25.85
- H 29.54



MAX. STRESS = 33213 PSI C NODES 121 & 122

IN KIP

STADPL - PLOT (REVISION 16.0)
 TITLE: FINITE ELEMENT ANALYSIS FOR W8X31 BASEPL
 STRUCTURE DATA NJ= 168, NM= 0, NE= 143

COMPANY: M&O
 DATE: JUN 21, 1996

Title: ESF Ground Support - Structural Steel Analysis

Page: X-1^o of X-33

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*****
*
*           S T A A D - III
*       Revision 16.0b
*       Proprietary Program of
*       RESEARCH ENGINEERS, Inc.
*       Date=      JUN 21, 1996
*       Time=      15: 3:44
*
*****

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1. STAAD SPACE FINITE ELEMENT ANALYSIS FOR W8X31 BASEPLATE
2. * THIS ANALYSIS DETERMINES STRESS IN 3/4" BASE PLATE
3. * SPRING CONSTANTS ARE BASED ON K = 4000 K/IN
4. * LOADING IS ON WEB AND FLANGES
5. * PLATE IS FIXED AT WELD LOCATIONS WITH FZ FREE OR KFZ SPRINGS
6. * FILENAME = "PLATEZ"
7. UNIT KIP IN
8. INPUT WIDTH 79
9. JOINT COORDINATES
10. 1 0.0 0.0 0.0 3 2.252 0.0 0.0
11. 4 3.052 0.0 0.0
12. 5 4.0705 0.0 0.0 7 6.1075 0.0 0.0
13. 8 6.3925 0.0 0.0 11 9.448 0.0 0.0
14. 12 10.248 0.0 0.0
15. 13 11.374 0.0 0.0 14 12.5 0 0
16. REPEAT ALL 11 0 .435 0 0 .75 0 0 .9383 0 15*0 0 .435 0 0 .315 0 0 .435 0
17. ELEMENT INCIDENCE
18. 1 1 2 16 15
19. REPEAT 12 1 1
20. REPEAT ALL 10 13 14
21. UNIT KIP INCH
22. ELEMENT PROPERTIES
23. 1 TO 143 TH 0.75
24. CONSTANTS
25. E 29000.0 ALL
26. DENSITY 0.000283 ALL
27. BETA 0 ALL
28. SUPPORTS
29. 72 83 86 97 FIXED BUT FX FY MX MY KFZ 4400
30. 71 84 85 98 FIXED BUT FX FY MX MY KFZ 2200
31. 73 82 87 96 FIXED BUT FX FY MX MY KFZ 3800
32. 75 76 79 80 89 90 93 94 FIXED BUT FX FY MX MY KFZ 4000
33. 49 63 77 91 FIXED BUT KFZ 2600
34. 105 FIXED BUT FX FY MX MY KFZ 2600
35. 50 64 78 92 FIXED BUT KFZ 2600
36. 106 FIXED BUT FX FY MX MY KFZ 2600
37. 133 134 FIXED BUT FX FY MX MY KFZ 600
38. 35 36 FIXED BUT FX FY MX MY KFZ 2300
39. 15 28 FIXED BUT FX FY MX MY KFZ 900
40. 43 56 57 70 99 112 FIXED BUT FX FY MX MY KFZ 2200
41. 127 140 FIXED BUT FX FY MX MY KFZ 500
42. 16 27 FIXED BUT FX FY MX MY KFZ 1800
43. 31 40 FIXED BUT FX FY MX MY KFZ 3400
44. 44 55 58 69 100 111 FIXED BUT FX FY MX MY KFZ 4400
45. 128 139 FIXED BUT FX FY MX MY KFZ 1000
46. 45 54 59 68 101 110 FIXED BUT FX FY MX MY KFZ 3800
47. 129 138 FIXED BUT FX FY MX MY KFZ 900

```

Title: ESF Ground Support - Structural Steel Analysis

Page: X-11 of X-33

48. 47 48 51 52 61 62 65 66 FIXED BUT FX FY MX MY KFZ 4000
 49. 103 104 107 108 FIXED BUT FX FY MX MY KFZ 4000
 50. 46 53 60 67 74 81 88 95 102 109 FIXED BUT FX FY MX MY KFZ 3600
 51. 29 42 FIXED BUT FX FY MX MY KFZ 2000
 52. 30 41 FIXED BUT FX FY MX MY KFZ 4000
 53. 33 34 37 38 FIXED BUT FX FY MX MY KFZ 3600
 54. 32 39 FIXED BUT FX FY MX MY KFZ 3200
 55. 113 126 FIXED BUT FX FY MX MY KFZ 1600
 56. 114 125 FIXED BUT FX FY MX MY KFZ 3200
 57. 115 124 FIXED BUT FX FY MX MY KFZ 2800
 58. 116 123 FIXED BUT FX FY MX MY KFZ 2600
 59. 117 118 121 122 FIXED BUT FX FY MX MY KFZ 2900
 60. 119 120 FIXED BUT FX FY MX MY KFZ 1900
 61. 130 137 FIXED BUT FX FY MX MY KFZ 800
 62. 131 132 135 136 FIXED BUT FX FY MX MY KFZ 900
 63. 17 26 FIXED BUT KFZ 1500
 64. 18 25 FIXED BUT KFZ 1400
 65. 19 20 23 24 FIXED BUT KFZ 1600
 66. 21 22 FIXED BUT FX FY MX MY KFZ 1000
 67. 143 TO 146 FIXED BUT FZ
 68. 149 TO 152 FIXED BUT FZ
 69. UNIT KIP IN
 70. LOAD 1 PRESSURE ON WEB & FLANGES ONLY FROM 121.8 K AXIAL LOAD
 71. ELEMENT LOAD
 72. 3 TO 11 PRESSURE 13.341
 73. 133 TO 141 PRESSURE 13.341
 74. 20 33 46 59 72 85 98 111 124 PRESSURE 13.341
 75. PERFORM ANALYSIS

P R O B L E M S T A T I S T I C S

 NUMBER OF JOINTS/MEMBER+ELEMENTS/SUPPORTS = 168/ 143/ 134
 ORIGINAL/FINAL BAND-WIDTH = 15/ 15
 TOTAL PRIMARY LOAD CASES = 1, TOTAL DEGREES OF FREEDOM = 1008
 SIZE OF STIFFNESS MATRIX = 96768 DOUBLE PREC. WORDS
 TOTAL REQUIRED DISK SPACE = 2.55 MEGA-BYTES

++ PROCESSING ELEMENT STIFFNESS MATRIX.	15: 3:48
++ PROCESSING GLOBAL STIFFNESS MATRIX.	15: 4: 6
++ PROCESSING TRIANGULAR FACTORIZATION.	15: 4:38
++ CALCULATING JOINT DISPLACEMENTS.	15: 5:18
++ CALCULATING MEMBER FORCES.	15: 5:22

76. PRINT SUPPORT REACTIONS

Title: ESF Ground Support - Structural Steel AnalysisPage: X-12 of X-33

SUPPORT REACTIONS -UNIT KIP IN

STRUCTURE TYPE = SPACE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
72	1	0.00	0.00	0.20	0.00	0.00	0.00
83	1	0.00	0.00	0.20	0.00	0.00	0.00
86	1	0.00	0.00	0.20	0.00	0.00	0.00
97	1	0.00	0.00	0.20	0.00	0.00	0.00
71	1	0.00	0.00	0.09	0.00	0.00	0.00
84	1	0.00	0.00	0.09	0.00	0.00	0.00
85	1	0.00	0.00	0.15	0.00	0.00	0.00
98	1	0.00	0.00	0.15	0.00	0.00	0.00
73	1	0.00	0.00	0.24	0.00	0.00	0.00
82	1	0.00	0.00	0.24	0.00	0.00	0.00
87	1	0.00	0.00	0.15	0.00	0.00	0.00
96	1	0.00	0.00	0.15	0.00	0.00	0.00
75	1	0.00	0.00	0.24	0.00	0.00	0.00
76	1	0.00	0.00	-0.42	0.00	0.00	0.00
79	1	0.00	0.00	-0.42	0.00	0.00	0.00
80	1	0.00	0.00	0.24	0.00	0.00	0.00
89	1	0.00	0.00	0.09	0.00	0.00	0.00
90	1	0.00	0.00	-0.45	0.00	0.00	0.00
93	1	0.00	0.00	-0.45	0.00	0.00	0.00
94	1	0.00	0.00	0.09	0.00	0.00	0.00
49	1	0.00	0.00	-1.29	0.97	0.42	0.00
63	1	0.00	0.00	-1.03	0.24	0.59	0.00
77	1	0.00	0.00	-0.94	0.08	0.62	0.00
91	1	0.00	0.00	-0.90	-0.28	0.50	0.00
105	1	0.00	0.00	-1.53	0.00	0.00	0.00
50	1	0.00	0.00	-1.29	0.97	-0.42	0.00
64	1	0.00	0.00	-1.03	0.24	-0.59	0.00
78	1	0.00	0.00	-0.94	0.08	-0.62	0.00
92	1	0.00	0.00	-0.90	-0.28	-0.50	0.00
106	1	0.00	0.00	-1.53	0.00	0.00	0.00
133	1	0.00	0.00	-1.42	0.00	0.00	0.00
134	1	0.00	0.00	-1.42	0.00	0.00	0.00
35	1	0.00	0.00	-2.39	0.00	0.00	0.00
36	1	0.00	0.00	-2.39	0.00	0.00	0.00
15	1	0.00	0.00	-0.03	0.00	0.00	0.00
28	1	0.00	0.00	-0.03	0.00	0.00	0.00
43	1	0.00	0.00	0.14	0.00	0.00	0.00
56	1	0.00	0.00	0.14	0.00	0.00	0.00
57	1	0.00	0.00	0.10	0.00	0.00	0.00
70	1	0.00	0.00	0.10	0.00	0.00	0.00
99	1	0.00	0.00	0.20	0.00	0.00	0.00
112	1	0.00	0.00	0.20	0.00	0.00	0.00
127	1	0.00	0.00	-0.05	0.00	0.00	0.00
140	1	0.00	0.00	-0.05	0.00	0.00	0.00
16	1	0.00	0.00	-0.68	0.00	0.00	0.00
27	1	0.00	0.00	-0.68	0.00	0.00	0.00
31	1	0.00	0.00	-1.64	0.00	0.00	0.00
40	1	0.00	0.00	-1.64	0.00	0.00	0.00
44	1	0.00	0.00	-0.08	0.00	0.00	0.00
55	1	0.00	0.00	-0.08	0.00	0.00	0.00

SUPPORT REACTIONS -UNIT KIP IN

STRUCTURE TYPE = SPACE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
58	1	0.00	0.00	0.15	0.00	0.00	0.00
69	1	0.00	0.00	0.15	0.00	0.00	0.00
100	1	0.00	0.00	-0.17	0.00	0.00	0.00
111	1	0.00	0.00	-0.17	0.00	0.00	0.00
128	1	0.00	0.00	-0.55	0.00	0.00	0.00
139	1	0.00	0.00	-0.55	0.00	0.00	0.00
45	1	0.00	0.00	-0.36	0.00	0.00	0.00
54	1	0.00	0.00	-0.36	0.00	0.00	0.00
59	1	0.00	0.00	0.14	0.00	0.00	0.00
68	1	0.00	0.00	0.14	0.00	0.00	0.00
101	1	0.00	0.00	-0.57	0.00	0.00	0.00
110	1	0.00	0.00	-0.57	0.00	0.00	0.00
129	1	0.00	0.00	-1.02	0.00	0.00	0.00
138	1	0.00	0.00	-1.02	0.00	0.00	0.00
47	1	0.00	0.00	-0.79	0.00	0.00	0.00
48	1	0.00	0.00	-1.21	0.00	0.00	0.00
51	1	0.00	0.00	-1.21	0.00	0.00	0.00
52	1	0.00	0.00	-0.79	0.00	0.00	0.00
61	1	0.00	0.00	0.07	0.00	0.00	0.00
62	1	0.00	0.00	-0.57	0.00	0.00	0.00
65	1	0.00	0.00	-0.57	0.00	0.00	0.00
66	1	0.00	0.00	0.07	0.00	0.00	0.00
103	1	0.00	0.00	-1.18	0.00	0.00	0.00
104	1	0.00	0.00	-1.58	0.00	0.00	0.00
107	1	0.00	0.00	-1.58	0.00	0.00	0.00
108	1	0.00	0.00	-1.18	0.00	0.00	0.00
46	1	0.00	0.00	-0.52	0.00	0.00	0.00
53	1	0.00	0.00	-0.52	0.00	0.00	0.00
60	1	0.00	0.00	0.15	0.00	0.00	0.00
67	1	0.00	0.00	0.15	0.00	0.00	0.00
74	1	0.00	0.00	0.29	0.00	0.00	0.00
81	1	0.00	0.00	0.29	0.00	0.00	0.00
88	1	0.00	0.00	0.16	0.00	0.00	0.00
95	1	0.00	0.00	0.16	0.00	0.00	0.00
102	1	0.00	0.00	-0.80	0.00	0.00	0.00
109	1	0.00	0.00	-0.80	0.00	0.00	0.00
29	1	0.00	0.00	0.10	0.00	0.00	0.00
42	1	0.00	0.00	0.10	0.00	0.00	0.00
30	1	0.00	0.00	-0.75	0.00	0.00	0.00
41	1	0.00	0.00	-0.75	0.00	0.00	0.00
33	1	0.00	0.00	-3.02	0.00	0.00	0.00
34	1	0.00	0.00	-3.34	0.00	0.00	0.00
37	1	0.00	0.00	-3.34	0.00	0.00	0.00
38	1	0.00	0.00	-3.02	0.00	0.00	0.00
32	1	0.00	0.00	-2.12	0.00	0.00	0.00
39	1	0.00	0.00	-2.12	0.00	0.00	0.00
113	1	0.00	0.00	0.03	0.00	0.00	0.00
126	1	0.00	0.00	0.03	0.00	0.00	0.00
114	1	0.00	0.00	-1.04	0.00	0.00	0.00
125	1	0.00	0.00	-1.04	0.00	0.00	0.00

SUPPORT REACTIONS -UNIT KIP IN STRUCTURE TYPE = SPACE

JOINT	LOAD	FORCE-X	FORCE-Y	FORCE-Z	MOM-X	MOM-Y	MOM Z
115	1	0.00	0.00	-2.02	0.00	0.00	0.00
124	1	0.00	0.00	-2.02	0.00	0.00	0.00
116	1	0.00	0.00	-2.55	0.00	0.00	0.00
123	1	0.00	0.00	-2.55	0.00	0.00	0.00
117	1	0.00	0.00	-3.57	0.00	0.00	0.00
118	1	0.00	0.00	-4.05	0.00	0.00	0.00
121	1	0.00	0.00	-4.05	0.00	0.00	0.00
122	1	0.00	0.00	-3.57	0.00	0.00	0.00
119	1	0.00	0.00	-2.88	0.00	0.00	0.00
120	1	0.00	0.00	-2.88	0.00	0.00	0.00
130	1	0.00	0.00	-1.20	0.00	0.00	0.00
137	1	0.00	0.00	-1.20	0.00	0.00	0.00
131	1	0.00	0.00	-1.69	0.00	0.00	0.00
132	1	0.00	0.00	-1.97	0.00	0.00	0.00
135	1	0.00	0.00	-1.97	0.00	0.00	0.00
136	1	0.00	0.00	-1.69	0.00	0.00	0.00
17	1	0.00	0.00	-1.32	1.92	1.40	0.00
26	1	0.00	0.00	-1.32	1.92	-1.40	0.00
18	1	0.00	0.00	-1.74	2.89	1.10	0.00
25	1	0.00	0.00	-1.74	2.89	-1.10	0.00
19	1	0.00	0.00	-2.42	3.82	0.96	0.00
20	1	0.00	0.00	-2.85	4.18	1.36	0.00
23	1	0.00	0.00	-2.85	4.18	-1.36	0.00
24	1	0.00	0.00	-2.42	3.82	-0.96	0.00
21	1	0.00	0.00	-2.14	0.00	0.00	0.00
22	1	0.00	0.00	-2.14	0.00	0.00	0.00
143	1	0.00	0.00	0.00	-2.70	1.59	0.00
144	1	0.00	0.00	0.00	-3.79	1.36	0.00
145	1	0.00	0.00	0.00	-5.12	1.41	0.00
146	1	0.00	0.00	0.00	-5.64	1.92	0.00
149	1	0.00	0.00	0.00	-5.64	-1.92	0.00
150	1	0.00	0.00	0.00	-5.12	-1.41	0.00
151	1	0.00	0.00	0.00	-3.79	-1.36	0.00
152	1	0.00	0.00	0.00	-2.70	-1.59	0.00

***** END OF LATEST ANALYSIS RESULT *****

77. PRINT ELEMENT STRESSES

ELEMENT FORCES FORCE, LENGTH UNITS= KIP IN

FORCE OR STRESS = FORCE/WIDTH/THICK, MOMENT = FORCE-LENGTH/WIDTH

ELEMENT	LOAD	QX	QY FX	MX FY	MY FXY	MX
1	1	0.12	-0.12 0.00	-0.09 0.00	0.00 0.00	0.05
	TOP :	SMAX= 0.26	SMIN= -1.19	TMAX= 0.73	ANGLE= -26.1	
	BOTT:	SMAX= 1.19	SMIN= -0.26	TMAX= 0.73	ANGLE= -26.1	
2	1	1.34	-0.61 0.00	0.14 0.00	-0.13 0.00	0.08
	TOP :	SMAX= 1.77	SMIN= -1.60	TMAX= 1.68	ANGLE= 15.0	
	BOTT:	SMAX= 1.60	SMIN= -1.77	TMAX= 1.68	ANGLE= 15.0	
3	1	3.10	-3.38 0.00	-0.04 0.00	-0.53 0.00	0.30
	TOP :	SMAX= 1.15	SMIN= -7.15	TMAX= 4.15	ANGLE= 25.5	
	BOTT:	SMAX= 7.15	SMIN= -1.15	TMAX= 4.15	ANGLE= 25.5	
4	1	1.55	-3.65 0.00	-0.13 0.00	-0.59 0.00	0.19
	TOP :	SMAX= -0.66	SMIN= -7.04	TMAX= 3.19	ANGLE= 19.7	
	BOTT:	SMAX= 7.04	SMIN= 0.66	TMAX= 3.19	ANGLE= 19.7	
5	1	1.77	-4.43 0.00	-0.25 0.00	-0.80 0.00	0.26
	TOP :	SMAX= -1.52	SMIN= -9.64	TMAX= 4.06	ANGLE= 21.9	
	BOTT:	SMAX= 9.64	SMIN= 1.52	TMAX= 4.06	ANGLE= 21.9	
6	1	4.48	-3.59 0.00	-0.15 0.00	-0.56 0.00	0.79
	TOP :	SMAX= 4.90	SMIN= -12.45	TMAX= 8.67	ANGLE= 37.7	
	BOTT:	SMAX= 12.45	SMIN= -4.90	TMAX= 8.67	ANGLE= 37.7	
7	1	0.00	-0.41 0.00	1.16 0.00	0.20 0.00	0.00
	TOP :	SMAX= 12.36	SMIN= 2.17	TMAX= 5.10	ANGLE= 0.0	
	BOTT:	SMAX= -2.17	SMIN= -12.36	TMAX= 5.10	ANGLE= 0.0	
8	1	-4.48	-3.59 0.00	-0.15 0.00	-0.56 0.00	-0.79
	TOP :	SMAX= 4.90	SMIN= -12.45	TMAX= 8.67	ANGLE= -37.7	
	BOTT:	SMAX= 12.45	SMIN= -4.90	TMAX= 8.67	ANGLE= -37.7	
9	1	-1.77	-4.43 0.00	-0.25 0.00	-0.80 0.00	-0.26
	TOP :	SMAX= -1.52	SMIN= -9.64	TMAX= 4.06	ANGLE= -21.9	
	BOTT:	SMAX= 9.64	SMIN= 1.52	TMAX= 4.06	ANGLE= -21.9	
10	1	-1.55	-3.65 0.00	-0.13 0.00	-0.59 0.00	-0.19
	TOP :	SMAX= -0.66	SMIN= -7.04	TMAX= 3.19	ANGLE= -19.7	
	BOTT:	SMAX= 7.04	SMIN= 0.66	TMAX= 3.19	ANGLE= -19.7	

ELEMENT FORCES FORCE, LENGTH UNITS= KIP IN

FORCE OR STRESS = FORCE/WIDTH/THICK, MOMENT = FORCE-LENGTH/WIDTH

ELEMENT	LOAD	QX	QY FX	MX FY	MY FXY	MXY		
11	1	-3.10	-3.38 0.00	-0.04 0.00	-0.53 0.00	-0.30		
TOP :	SMAX=	1.15	SMIN=	-7.15	TMAX=	4.15	ANGLE=	-25.5
BOTT:	SMAX=	7.15	SMIN=	-1.15	TMAX=	4.15	ANGLE=	-25.5
12	1	-1.34	-0.61 0.00	0.14 0.00	-0.13 0.00	-0.08		
TOP :	SMAX=	1.77	SMIN=	-1.60	TMAX=	1.68	ANGLE=	-15.0
BOTT:	SMAX=	1.60	SMIN=	-1.77	TMAX=	1.68	ANGLE=	-15.0
13	1	-0.12	-0.12 0.00	-0.09 0.00	0.00 0.00	-0.05		
TOP :	SMAX=	0.26	SMIN=	-1.19	TMAX=	0.73	ANGLE=	26.1
BOTT:	SMAX=	1.19	SMIN=	-0.26	TMAX=	0.73	ANGLE=	26.1
14	1	-0.33	0.29 0.00	-0.10 0.00	-0.15 0.00	0.13		
TOP :	SMAX=	0.03	SMIN=	-2.72	TMAX=	1.37	ANGLE=	39.8
BOTT:	SMAX=	2.72	SMIN=	-0.03	TMAX=	1.37	ANGLE=	39.8
15	1	1.44	-1.61 0.00	0.24 0.00	0.29 0.00	-0.07		
TOP :	SMAX=	3.61	SMIN=	2.07	TMAX=	0.77	ANGLE=	34.4
BOTT:	SMAX=	-2.07	SMIN=	-3.61	TMAX=	0.77	ANGLE=	34.4
16	1	1.97	-3.39 0.00	0.22 0.00	0.81 0.00	-0.11		
TOP :	SMAX=	8.82	SMIN=	2.09	TMAX=	3.37	ANGLE=	10.3
BOTT:	SMAX=	-2.09	SMIN=	-8.82	TMAX=	3.37	ANGLE=	10.3
17	1	1.00	-4.19 0.00	0.30 0.00	1.02 0.00	-0.09		
TOP :	SMAX=	11.02	SMIN=	3.05	TMAX=	3.98	ANGLE=	7.1
BOTT:	SMAX=	-3.05	SMIN=	-11.02	TMAX=	3.98	ANGLE=	7.1
18	1	0.90	-5.30 0.00	0.32 0.00	1.20 0.00	-0.06		
TOP :	SMAX=	12.89	SMIN=	3.36	TMAX=	4.77	ANGLE=	4.0
BOTT:	SMAX=	-3.36	SMIN=	-12.89	TMAX=	4.77	ANGLE=	4.0
19	1	-0.16	-2.95 0.00	0.00 0.00	0.06 0.00	0.39		
TOP :	SMAX=	4.52	SMIN=	-3.83	TMAX=	4.17	ANGLE=	-42.8
BOTT:	SMAX=	3.83	SMIN=	-4.52	TMAX=	4.17	ANGLE=	-42.8
20	1	0.00	-0.78 0.00	0.34 0.00	-1.00 0.00	0.00		
TOP :	SMAX=	3.67	SMIN=	-10.64	TMAX=	7.16	ANGLE=	0.0
BOTT:	SMAX=	10.64	SMIN=	-3.67	TMAX=	7.16	ANGLE=	0.0

ELEMENT FORCES FORCE, LENGTH UNITS= KIP IN

FORCE OR STRESS = FORCE/WIDTH/THICK, MOMENT = FORCE-LENGTH/WIDTH

ELEMENT	LOAD	QX	QY FX	MX FY	MY FXY	MXY
21	1	0.16	-2.95 0.00	0.00 0.00	0.06 0.00	-0.39
	TOP :	SMAX= 4.52	SMIN= -3.83	TMAX= 4.17	ANGLE= 42.8	
	BOTT:	SMAX= 3.83	SMIN= -4.52	TMAX= 4.17	ANGLE= 42.8	
22	1	-0.90	-5.30 0.00	0.32 0.00	1.20 0.00	0.06
	TOP :	SMAX= 12.89	SMIN= 3.36	TMAX= 4.77	ANGLE= -4.0	
	BOTT:	SMAX= -3.36	SMIN= -12.89	TMAX= 4.77	ANGLE= -4.0	
23	1	-1.00	-4.19 0.00	0.30 0.00	1.02 0.00	0.09
	TOP :	SMAX= 11.02	SMIN= 3.05	TMAX= 3.98	ANGLE= -7.1	
	BOTT:	SMAX= -3.05	SMIN= -11.02	TMAX= 3.98	ANGLE= -7.1	
24	1	-1.97	-3.39 0.00	0.22 0.00	0.81 0.00	0.11
	TOP :	SMAX= 8.82	SMIN= 2.09	TMAX= 3.37	ANGLE= -10.3	
	BOTT:	SMAX= -2.09	SMIN= -8.82	TMAX= 3.37	ANGLE= -10.3	
25	1	-1.44	-1.61 0.00	0.24 0.00	0.29 0.00	0.07
	TOP :	SMAX= 3.61	SMIN= 2.07	TMAX= 0.77	ANGLE= -34.4	
	BOTT:	SMAX= -2.07	SMIN= -3.61	TMAX= 0.77	ANGLE= -34.4	
26	1	0.33	0.29 0.00	-0.10 0.00	-0.15 0.00	-0.13
	TOP :	SMAX= 0.03	SMIN= -2.72	TMAX= 1.37	ANGLE= -39.8	
	BOTT:	SMAX= 2.72	SMIN= -0.03	TMAX= 1.37	ANGLE= -39.8	
27	1	-0.16	0.25 0.00	-0.06 0.00	-0.12 0.00	0.11
	TOP :	SMAX= 0.20	SMIN= -2.14	TMAX= 1.17	ANGLE= 36.7	
	BOTT:	SMAX= 2.14	SMIN= -0.20	TMAX= 1.17	ANGLE= 36.7	
28	1	-0.17	-0.12 0.00	-0.05 0.00	-0.19 0.00	0.16
	TOP :	SMAX= 0.56	SMIN= -3.13	TMAX= 1.85	ANGLE= 32.8	
	BOTT:	SMAX= 3.13	SMIN= -0.56	TMAX= 1.85	ANGLE= 32.8	
29	1	-0.27	-0.39 0.00	-0.05 0.00	-0.26 0.00	0.15
	TOP :	SMAX= 0.32	SMIN= -3.64	TMAX= 1.98	ANGLE= 27.5	
	BOTT:	SMAX= 3.64	SMIN= -0.32	TMAX= 1.98	ANGLE= 27.5	
30	1	-0.33	-0.62 0.00	-0.04 0.00	-0.33 0.00	0.11
	TOP :	SMAX= -0.09	SMIN= -3.85	TMAX= 1.88	ANGLE= 18.3	
	BOTT:	SMAX= 3.85	SMIN= 0.09	TMAX= 1.88	ANGLE= 18.3	

ELEMENT FORCES FORCE, LENGTH UNITS= KIP IN

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ELEMENT	LOAD	QX	QY FX	MX FY	MY FXY	MX	MY
31	1	-0.41	-0.42 0.00	-0.13 0.00	-0.45 0.00	0.05	
	TOP :	SMAX=	-1.31	SMIN=	-4.85	TMAX=	1.77
	BOTT:	SMAX=	4.85	SMIN=	1.31	TMAX=	1.77
						ANGLE=	8.3
						ANGLE=	8.3
32	1	0.07	-0.25 0.00	-0.06 0.00	-0.80 0.00	-0.06	
	TOP :	SMAX=	-0.61	SMIN=	-8.64	TMAX=	4.02
	BOTT:	SMAX=	8.64	SMIN=	0.61	TMAX=	4.02
						ANGLE=	-4.8
						ANGLE=	-4.8
33	1	0.00	-0.74 0.00	-0.25 0.00	-1.17 0.00	0.00	
	TOP :	SMAX=	-2.71	SMIN=	-12.46	TMAX=	4.87
	BOTT:	SMAX=	12.46	SMIN=	2.71	TMAX=	4.87
						ANGLE=	0.0
						ANGLE=	0.0
34	1	-0.07	-0.25 0.00	-0.06 0.00	-0.80 0.00	0.06	
	TOP :	SMAX=	-0.61	SMIN=	-8.64	TMAX=	4.02
	BOTT:	SMAX=	8.64	SMIN=	0.61	TMAX=	4.02
						ANGLE=	4.8
						ANGLE=	4.8
35	1	0.41	-0.42 0.00	-0.13 0.00	-0.45 0.00	-0.05	
	TOP :	SMAX=	-1.31	SMIN=	-4.85	TMAX=	1.77
	BOTT:	SMAX=	4.85	SMIN=	1.31	TMAX=	1.77
						ANGLE=	-8.3
						ANGLE=	-8.3
36	1	0.33	-0.62 0.00	-0.04 0.00	-0.33 0.00	-0.11	
	TOP :	SMAX=	-0.09	SMIN=	-3.85	TMAX=	1.88
	BOTT:	SMAX=	3.85	SMIN=	0.09	TMAX=	1.88
						ANGLE=	-18.3
						ANGLE=	-18.3
37	1	0.27	-0.39 0.00	-0.05 0.00	-0.26 0.00	-0.15	
	TOP :	SMAX=	0.32	SMIN=	-3.64	TMAX=	1.98
	BOTT:	SMAX=	3.64	SMIN=	-0.32	TMAX=	1.98
						ANGLE=	-27.5
						ANGLE=	-27.5
38	1	0.17	-0.12 0.00	-0.05 0.00	-0.19 0.00	-0.16	
	TOP :	SMAX=	0.56	SMIN=	-3.13	TMAX=	1.85
	BOTT:	SMAX=	3.13	SMIN=	-0.56	TMAX=	1.85
						ANGLE=	-32.8
						ANGLE=	-32.8
39	1	0.16	0.25 0.00	-0.06 0.00	-0.12 0.00	-0.11	
	TOP :	SMAX=	0.20	SMIN=	-2.14	TMAX=	1.17
	BOTT:	SMAX=	2.14	SMIN=	-0.20	TMAX=	1.17
						ANGLE=	-36.7
						ANGLE=	-36.7
40	1	-0.09	0.19 0.00	-0.02 0.00	-0.06 0.00	0.06	
	TOP :	SMAX=	0.21	SMIN=	-1.07	TMAX=	0.64
	BOTT:	SMAX=	1.07	SMIN=	-0.21	TMAX=	0.64
						ANGLE=	33.6
						ANGLE=	33.6

ELEMENT FORCES FORCE, LENGTH UNITS= KIP IN

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ELEMENT	LOAD	QX	QY FX	MX FY	MY FXY	MXY
41	1	-0.16	0.20 0.00	-0.03 0.00	-0.16 0.00	0.07
	TOP :	SMAX= 0.03	SMIN= -2.00	TMAX= 1.02	ANGLE= 23.6	
	BOTT:	SMAX= 2.00	SMIN= -0.03	TMAX= 1.02	ANGLE= 23.6	
42	1	-0.16	0.33 0.00	-0.07 0.00	-0.27 0.00	0.06
	TOP :	SMAX= -0.53	SMIN= -3.04	TMAX= 1.25	ANGLE= 16.3	
	BOTT:	SMAX= 3.04	SMIN= 0.53	TMAX= 1.25	ANGLE= 16.3	
43	1	-0.19	0.31 0.00	-0.13 0.00	-0.35 0.00	0.03
	TOP :	SMAX= -1.33	SMIN= -3.75	TMAX= 1.21	ANGLE= 7.0	
	BOTT:	SMAX= 3.75	SMIN= 1.33	TMAX= 1.21	ANGLE= 7.0	
44	1	-0.06	0.55 0.00	-0.22 0.00	-0.41 0.00	-0.02
	TOP :	SMAX= -2.29	SMIN= -4.44	TMAX= 1.08	ANGLE= -6.0	
	BOTT:	SMAX= 4.44	SMIN= 2.29	TMAX= 1.08	ANGLE= -6.0	
45	1	1.30	0.09 0.00	0.15 0.00	-0.15 0.00	-0.13
	TOP :	SMAX= 2.14	SMIN= -2.12	TMAX= 2.13	ANGLE= -20.3	
	BOTT:	SMAX= 2.12	SMIN= -2.14	TMAX= 2.13	ANGLE= -20.3	
46	1	0.00	-1.11 0.00	0.00 0.00	0.00 0.00	0.00
	TOP :	SMAX= 0.00	SMIN= 0.00	TMAX= 0.00	ANGLE= 90.0	
	BOTT:	SMAX= 0.00	SMIN= 0.00	TMAX= 0.00	ANGLE= 90.0	
47	1	-1.30	0.09 0.00	0.15 0.00	-0.15 0.00	0.13
	TOP :	SMAX= 2.14	SMIN= -2.12	TMAX= 2.13	ANGLE= 20.3	
	BOTT:	SMAX= 2.12	SMIN= -2.14	TMAX= 2.13	ANGLE= 20.3	
48	1	0.06	0.55 0.00	-0.22 0.00	-0.41 0.00	0.02
	TOP :	SMAX= -2.29	SMIN= -4.44	TMAX= 1.08	ANGLE= 6.0	
	BOTT:	SMAX= 4.44	SMIN= 2.29	TMAX= 1.08	ANGLE= 6.0	
49	1	0.19	0.31 0.00	-0.13 0.00	-0.35 0.00	-0.03
	TOP :	SMAX= -1.33	SMIN= -3.75	TMAX= 1.21	ANGLE= -7.0	
	BOTT:	SMAX= 3.75	SMIN= 1.33	TMAX= 1.21	ANGLE= -7.0	
50	1	0.16	0.33 0.00	-0.07 0.00	-0.27 0.00	-0.06
	TOP :	SMAX= -0.53	SMIN= -3.04	TMAX= 1.25	ANGLE= -16.3	
	BOTT:	SMAX= 3.04	SMIN= 0.53	TMAX= 1.25	ANGLE= -16.3	

ELEMENT FORCES FORCE, LENGTH UNITS= KIP IN

FORCE OR STRESS = FORCE/WIDTH/THICK, MOMENT = FORCE-LENGTH/WIDTH

ELEMENT	LOAD	QX	QY FX	MX FY	MY FXY	MAX		
51	1	0.16	0.20 0.00	-0.03 0.00	-0.16 0.00	-0.07		
TOP :	SMAX=	0.03	SMIN=	-2.00	TMAX=	1.02	ANGLE=	-23.6
BOTT:	SMAX=	2.00	SMIN=	-0.03	TMAX=	1.02	ANGLE=	-23.6
52	1	0.09	0.19 0.00	-0.02 0.00	-0.06 0.00	-0.06		
TOP :	SMAX=	0.21	SMIN=	-1.07	TMAX=	0.64	ANGLE=	-33.6
BOTT:	SMAX=	1.07	SMIN=	-0.21	TMAX=	0.64	ANGLE=	-33.6
53	1	-0.01	0.06 0.00	0.00 0.00	-0.01 0.00	0.01		
TOP :	SMAX=	0.08	SMIN=	-0.19	TMAX=	0.13	ANGLE=	90.0
BOTT:	SMAX=	0.19	SMIN=	-0.08	TMAX=	0.13	ANGLE=	90.0
54	1	-0.08	0.07 0.00	-0.01 0.00	-0.06 0.00	0.01		
TOP :	SMAX=	-0.02	SMIN=	-0.64	TMAX=	0.31	ANGLE=	15.5
BOTT:	SMAX=	0.64	SMIN=	0.02	TMAX=	0.31	ANGLE=	15.5
55	1	-0.12	0.12 0.00	-0.04 0.00	-0.11 0.00	0.01		
TOP :	SMAX=	-0.35	SMIN=	-1.18	TMAX=	0.41	ANGLE=	10.4
BOTT:	SMAX=	1.18	SMIN=	0.35	TMAX=	0.41	ANGLE=	10.4
56	1	-0.15	0.13 0.00	-0.12 0.00	-0.15 0.00	0.01		
TOP :	SMAX=	-1.28	SMIN=	-1.63	TMAX=	0.17	ANGLE=	9.5
BOTT:	SMAX=	1.63	SMIN=	1.28	TMAX=	0.17	ANGLE=	9.5
57	1	0.04	0.18 0.00	-0.19 0.00	-0.16 0.00	0.00		
TOP :	SMAX=	-1.66	SMIN=	-2.06	TMAX=	0.20	ANGLE=	2.3
BOTT:	SMAX=	2.06	SMIN=	1.66	TMAX=	0.20	ANGLE=	2.3
58	1	1.12	-0.05 0.00	0.24 0.00	0.02 0.00	-0.03		
TOP :	SMAX=	2.58	SMIN=	0.13	TMAX=	1.22	ANGLE=	-6.6
BOTT:	SMAX=	-0.13	SMIN=	-2.58	TMAX=	1.22	ANGLE=	-6.6
59	1	0.00	-0.39 0.00	0.00 0.00	0.00 0.00	0.00		
TOP :	SMAX=	0.00	SMIN=	0.00	TMAX=	0.00	ANGLE=	90.0
BOTT:	SMAX=	0.00	SMIN=	0.00	TMAX=	0.00	ANGLE=	90.0
60	1	-1.12	-0.05 0.00	0.24 0.00	0.02 0.00	0.03		
TOP :	SMAX=	2.58	SMIN=	0.13	TMAX=	1.22	ANGLE=	6.6
BOTT:	SMAX=	-0.13	SMIN=	-2.58	TMAX=	1.22	ANGLE=	6.6

ELEMENT FORCES FORCE, LENGTH UNITS= KIP IN

FORCE OR STRESS = FORCE/WIDTH/THICK, MOMENT = FORCE-LENGTH/WIDTH

ELEMENT	LOAD	QX	QY FX	MX FY	MY FXY	MXY			
61	1	-0.04	0.18 0.00	-0.19 0.00	-0.16 0.00	0.00			
	TOP :	SMAX=	-1.66	SMIN=	-2.06	TMAX=	0.20	ANGLE=	-2.3
	BOTT:	SMAX=	2.06	SMIN=	1.66	TMAX=	0.20	ANGLE=	-2.3
62	1	0.15	0.13 0.00	-0.12 0.00	-0.15 0.00	-0.01			
	TOP :	SMAX=	-1.28	SMIN=	-1.63	TMAX=	0.17	ANGLE=	-9.5
	BOTT:	SMAX=	1.63	SMIN=	1.28	TMAX=	0.17	ANGLE=	-9.5
63	1	0.12	0.12 0.00	-0.04 0.00	-0.11 0.00	-0.01			
	TOP :	SMAX=	-0.35	SMIN=	-1.18	TMAX=	0.41	ANGLE=	-10.4
	BOTT:	SMAX=	1.18	SMIN=	0.35	TMAX=	0.41	ANGLE=	-10.4
64	1	0.08	0.07 0.00	-0.01 0.00	-0.06 0.00	-0.01			
	TOP :	SMAX=	-0.02	SMIN=	-0.64	TMAX=	0.31	ANGLE=	-15.5
	BOTT:	SMAX=	0.64	SMIN=	0.02	TMAX=	0.31	ANGLE=	-15.5
65	1	0.01	0.06 0.00	0.00 0.00	-0.01 0.00	-0.01			
	TOP :	SMAX=	0.08	SMIN=	-0.19	TMAX=	0.13	ANGLE=	90.0
	BOTT:	SMAX=	0.19	SMIN=	-0.08	TMAX=	0.13	ANGLE=	90.0
66	1	-0.02	-0.12 0.00	-0.01 0.00	-0.03 0.00	-0.02			
	TOP :	SMAX=	0.08	SMIN=	-0.43	TMAX=	0.25	ANGLE=	-32.8
	BOTT:	SMAX=	0.43	SMIN=	-0.08	TMAX=	0.25	ANGLE=	-32.8
67	1	-0.10	-0.15 0.00	-0.01 0.00	-0.09 0.00	-0.02			
	TOP :	SMAX=	-0.04	SMIN=	-0.99	TMAX=	0.47	ANGLE=	-16.0
	BOTT:	SMAX=	0.99	SMIN=	0.04	TMAX=	0.47	ANGLE=	-16.0
68	1	-0.13	-0.25 0.00	-0.04 0.00	-0.15 0.00	-0.02			
	TOP :	SMAX=	-0.44	SMIN=	-1.66	TMAX=	0.61	ANGLE=	-9.6
	BOTT:	SMAX=	1.66	SMIN=	0.44	TMAX=	0.61	ANGLE=	-9.6
69	1	-0.16	-0.27 0.00	-0.13 0.00	-0.21 0.00	0.00			
	TOP :	SMAX=	-1.38	SMIN=	-2.23	TMAX=	0.42	ANGLE=	-3.2
	BOTT:	SMAX=	2.23	SMIN=	1.38	TMAX=	0.42	ANGLE=	-3.2
70	1	-0.02	-0.37 0.00	-0.20 0.00	-0.24 0.00	0.02			
	TOP :	SMAX=	-2.10	SMIN=	-2.63	TMAX=	0.26	ANGLE=	21.2
	BOTT:	SMAX=	2.63	SMIN=	2.10	TMAX=	0.26	ANGLE=	21.2

ELEMENT FORCES FORCE, LENGTH UNITS= KIP IN

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ELEMENT	LOAD	QX	QY FX	MX FY	MY FGY	MX	MY
71	1	1.18	-0.33 0.00	0.21 0.00	-0.04 0.00	0.03	
	TOP :	SMAX= 2.28	SMIN= -0.49	TMAX= 1.39	ANGLE= 7.3		
	BOTT:	SMAX= 0.49	SMIN= -2.28	TMAX= 1.39	ANGLE= 7.3		
72	1	0.00	-0.18 0.00	0.00 0.00	0.00 0.00	0.00	
	TOP :	SMAX= 0.00	SMIN= 0.00	TMAX= 0.00	ANGLE= 90.0		
	BOTT:	SMAX= 0.00	SMIN= 0.00	TMAX= 0.00	ANGLE= 90.0		
73	1	-1.18	-0.33 0.00	0.21 0.00	-0.04 0.00	-0.03	
	TOP :	SMAX= 2.28	SMIN= -0.49	TMAX= 1.39	ANGLE= -7.3		
	BOTT:	SMAX= 0.49	SMIN= -2.28	TMAX= 1.39	ANGLE= -7.3		
74	1	0.02	-0.37 0.00	-0.20 0.00	-0.24 0.00	-0.02	
	TOP :	SMAX= -2.10	SMIN= -2.63	TMAX= 0.26	ANGLE= -21.2		
	BOTT:	SMAX= 2.63	SMIN= 2.10	TMAX= 0.26	ANGLE= -21.2		
75	1	0.16	-0.27 0.00	-0.13 0.00	-0.21 0.00	0.00	
	TOP :	SMAX= -1.38	SMIN= -2.23	TMAX= 0.42	ANGLE= 3.2		
	BOTT:	SMAX= 2.23	SMIN= 1.38	TMAX= 0.42	ANGLE= 3.2		
76	1	0.13	-0.25 0.00	-0.04 0.00	-0.15 0.00	0.02	
	TOP :	SMAX= -0.44	SMIN= -1.66	TMAX= 0.61	ANGLE= 9.6		
	BOTT:	SMAX= 1.66	SMIN= 0.44	TMAX= 0.61	ANGLE= 9.6		
77	1	0.10	-0.15 0.00	-0.01 0.00	-0.09 0.00	0.02	
	TOP :	SMAX= -0.04	SMIN= -0.99	TMAX= 0.47	ANGLE= 16.0		
	BOTT:	SMAX= 0.99	SMIN= 0.04	TMAX= 0.47	ANGLE= 16.0		
78	1	0.02	-0.12 0.00	-0.01 0.00	-0.03 0.00	0.02	
	TOP :	SMAX= 0.08	SMIN= -0.43	TMAX= 0.25	ANGLE= 32.8		
	BOTT:	SMAX= 0.43	SMIN= -0.08	TMAX= 0.25	ANGLE= 32.8		
79	1	-0.13	-0.32 0.00	-0.03 0.00	-0.13 0.00	-0.08	
	TOP :	SMAX= 0.12	SMIN= -1.89	TMAX= 1.01	ANGLE= -28.6		
	BOTT:	SMAX= 1.89	SMIN= -0.12	TMAX= 1.01	ANGLE= -28.6		
80	1	-0.23	-0.31 0.00	-0.05 0.00	-0.26 0.00	-0.10	
	TOP :	SMAX= -0.12	SMIN= -3.19	TMAX= 1.54	ANGLE= -21.7		
	BOTT:	SMAX= 3.19	SMIN= 0.12	TMAX= 1.54	ANGLE= -21.7		

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ELEMENT	LOAD	QX	QY FX	MX FY	MY FXY	MXY		
81	1	-0.23	-0.47 0.00	-0.10 0.00	-0.40 0.00	-0.09		
TOP :	SMAX=	-0.76	SMIN=	-4.54	TMAX=	1.89	ANGLE=	-15.3
BOTT:	SMAX=	4.54	SMIN=	0.76	TMAX=	1.89	ANGLE=	-15.3
82	1	-0.26	-0.48 0.00	-0.16 0.00	-0.52 0.00	-0.05		
TOP :	SMAX=	-1.59	SMIN=	-5.65	TMAX=	2.03	ANGLE=	-8.2
BOTT:	SMAX=	5.65	SMIN=	1.59	TMAX=	2.03	ANGLE=	-8.2
83	1	-0.11	-0.65 0.00	-0.24 0.00	-0.61 0.00	0.01		
TOP :	SMAX=	-2.56	SMIN=	-6.51	TMAX=	1.97	ANGLE=	2.0
BOTT:	SMAX=	6.51	SMIN=	2.56	TMAX=	1.97	ANGLE=	2.0
84	1	0.77	-0.77 0.00	-0.02 0.00	-0.62 0.00	0.04		
TOP :	SMAX=	-0.16	SMIN=	-6.69	TMAX=	3.26	ANGLE=	3.8
BOTT:	SMAX=	6.69	SMIN=	0.16	TMAX=	3.26	ANGLE=	3.8
85	1	0.00	-0.45 0.00	0.06 0.00	-0.66 0.00	0.00		
TOP :	SMAX=	0.62	SMIN=	-7.08	TMAX=	3.85	ANGLE=	0.0
BOTT:	SMAX=	7.08	SMIN=	-0.62	TMAX=	3.85	ANGLE=	0.0
86	1	-0.77	-0.77 0.00	-0.02 0.00	-0.62 0.00	-0.04		
TOP :	SMAX=	-0.16	SMIN=	-6.69	TMAX=	3.26	ANGLE=	-3.8
BOTT:	SMAX=	6.69	SMIN=	0.16	TMAX=	3.26	ANGLE=	-3.8
87	1	0.11	-0.65 0.00	-0.24 0.00	-0.61 0.00	-0.01		
TOP :	SMAX=	-2.56	SMIN=	-6.51	TMAX=	1.97	ANGLE=	-2.0
BOTT:	SMAX=	6.51	SMIN=	2.56	TMAX=	1.97	ANGLE=	-2.0
88	1	0.26	-0.48 0.00	-0.16 0.00	-0.52 0.00	0.05		
TOP :	SMAX=	-1.59	SMIN=	-5.65	TMAX=	2.03	ANGLE=	8.2
BOTT:	SMAX=	5.65	SMIN=	1.59	TMAX=	2.03	ANGLE=	8.2
89	1	0.23	-0.47 0.00	-0.10 0.00	-0.40 0.00	0.09		
TOP :	SMAX=	-0.76	SMIN=	-4.54	TMAX=	1.89	ANGLE=	15.3
BOTT:	SMAX=	4.54	SMIN=	0.76	TMAX=	1.89	ANGLE=	15.3
90	1	0.23	-0.31 0.00	-0.05 0.00	-0.26 0.00	0.10		
TOP :	SMAX=	-0.12	SMIN=	-3.19	TMAX=	1.54	ANGLE=	21.7
BOTT:	SMAX=	3.19	SMIN=	0.12	TMAX=	1.54	ANGLE=	21.7

Title: ESF Ground Support - Structural Steel Analysis

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ELEMENT	LOAD	QX	QY FX	MX FY	MY FXY	MXY
91	1	0.13	-0.32 0.00	-0.03 0.00	-0.13 0.00	0.08
	TOP :	SMAX= 0.12	SMIN= -1.89	TMAX= 1.01	ANGLE= 28.6	
	BOTT:	SMAX= 1.89	SMIN= -0.12	TMAX= 1.01	ANGLE= 28.6	
92	1	-0.26	-0.41 0.00	-0.07 0.00	-0.26 0.00	-0.15
	TOP :	SMAX= 0.06	SMIN= -3.61	TMAX= 1.84	ANGLE= -28.9	
	BOTT:	SMAX= 3.61	SMIN= -0.06	TMAX= 1.84	ANGLE= -28.9	
93	1	-0.07	0.21 0.00	-0.05 0.00	-0.30 0.00	-0.18
	TOP :	SMAX= 0.47	SMIN= -4.22	TMAX= 2.34	ANGLE= -27.5	
	BOTT:	SMAX= 4.22	SMIN= -0.47	TMAX= 2.34	ANGLE= -27.5	
94	1	-0.11	0.62 0.00	-0.09 0.00	-0.37 0.00	-0.17
	TOP :	SMAX= -0.05	SMIN= -4.80	TMAX= 2.37	ANGLE= -25.6	
	BOTT:	SMAX= 4.80	SMIN= 0.05	TMAX= 2.37	ANGLE= -25.6	
95	1	-0.29	0.94 0.00	-0.06 0.00	-0.43 0.00	-0.14
	TOP :	SMAX= -0.09	SMIN= -5.08	TMAX= 2.50	ANGLE= -18.5	
	BOTT:	SMAX= 5.08	SMIN= 0.09	TMAX= 2.50	ANGLE= -18.5	
96	1	-0.41	0.93 0.00	-0.15 0.00	-0.61 0.00	-0.08
	TOP :	SMAX= -1.45	SMIN= -6.64	TMAX= 2.59	ANGLE= -9.9	
	BOTT:	SMAX= 6.64	SMIN= 1.45	TMAX= 2.59	ANGLE= -9.9	
97	1	0.20	0.04 0.00	-0.08 0.00	-0.87 0.00	-0.04
	TOP :	SMAX= -0.88	SMIN= -9.29	TMAX= 4.20	ANGLE= -2.8	
	BOTT:	SMAX= 9.29	SMIN= 0.88	TMAX= 4.20	ANGLE= -2.8	
98	1	0.00	-1.21 0.00	-0.08 0.00	-1.03 0.00	0.00
	TOP :	SMAX= -0.81	SMIN= -11.03	TMAX= 5.11	ANGLE= 0.0	
	BOTT:	SMAX= 11.03	SMIN= 0.81	TMAX= 5.11	ANGLE= 0.0	
99	1	-0.20	0.04 0.00	-0.08 0.00	-0.87 0.00	0.04
	TOP :	SMAX= -0.88	SMIN= -9.29	TMAX= 4.20	ANGLE= 2.8	
	BOTT:	SMAX= 9.29	SMIN= 0.88	TMAX= 4.20	ANGLE= 2.8	
100	1	0.41	0.93 0.00	-0.15 0.00	-0.61 0.00	0.08
	TOP :	SMAX= -1.45	SMIN= -6.64	TMAX= 2.59	ANGLE= 9.9	
	BOTT:	SMAX= 6.64	SMIN= 1.45	TMAX= 2.59	ANGLE= 9.9	

Title: ESF Ground Support - Structural Steel Analysis

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ELEMENT	LOAD	QX	QY FX	MX FY	MY FXY	MXY			
101	1	0.29	0.94 0.00	-0.06 0.00	-0.43 0.00	0.14			
	TOP :	SMAX=	-0.09	SMIN=	-5.08	TMAX=	2.50	ANGLE=	18.5
	BOTT:	SMAX=	5.08	SMIN=	0.09	TMAX=	2.50	ANGLE=	18.5
102	1	0.11	0.62 0.00	-0.09 0.00	-0.37 0.00	0.17			
	TOP :	SMAX=	-0.05	SMIN=	-4.80	TMAX=	2.37	ANGLE=	25.6
	BOTT:	SMAX=	4.80	SMIN=	0.05	TMAX=	2.37	ANGLE=	25.6
103	1	0.07	0.21 0.00	-0.05 0.00	-0.30 0.00	0.18			
	TOP :	SMAX=	0.47	SMIN=	-4.22	TMAX=	2.34	ANGLE=	27.5
	BOTT:	SMAX=	4.22	SMIN=	-0.47	TMAX=	2.34	ANGLE=	27.5
104	1	0.26	-0.41 0.00	-0.07 0.00	-0.26 0.00	0.15			
	TOP :	SMAX=	0.06	SMIN=	-3.61	TMAX=	1.84	ANGLE=	28.9
	BOTT:	SMAX=	3.61	SMIN=	-0.06	TMAX=	1.84	ANGLE=	28.9
105	1	-0.31	-0.09 0.00	-0.10 0.00	-0.28 0.00	-0.13			
	TOP :	SMAX=	-0.30	SMIN=	-3.71	TMAX=	1.70	ANGLE=	-27.9
	BOTT:	SMAX=	3.71	SMIN=	0.30	TMAX=	1.70	ANGLE=	-27.9
106	1	0.93	2.16 0.00	0.09 0.00	0.09 0.00	-0.08			
	TOP :	SMAX=	1.84	SMIN=	0.11	TMAX=	0.87	ANGLE=	90.0
	BOTT:	SMAX=	-0.11	SMIN=	-1.84	TMAX=	0.87	ANGLE=	90.0
107	1	0.77	4.21 0.00	0.14 0.00	0.54 0.00	-0.08			
	TOP :	SMAX=	5.94	SMIN=	1.36	TMAX=	2.29	ANGLE=	10.9
	BOTT:	SMAX=	-1.36	SMIN=	-5.94	TMAX=	2.29	ANGLE=	10.9
108	1	0.35	5.25 0.00	0.26 0.00	0.74 0.00	-0.07			
	TOP :	SMAX=	8.01	SMIN=	2.71	TMAX=	2.65	ANGLE=	8.1
	BOTT:	SMAX=	-2.71	SMIN=	-8.01	TMAX=	2.65	ANGLE=	8.1
109	1	-0.02	6.27 0.00	0.20 0.00	0.74 0.00	-0.15			
	TOP :	SMAX=	8.33	SMIN=	1.73	TMAX=	3.30	ANGLE=	14.0
	BOTT:	SMAX=	-1.73	SMIN=	-8.33	TMAX=	3.30	ANGLE=	14.0
110	1	-0.51	4.02 0.00	0.11 0.00	-0.30 0.00	-0.36			
	TOP :	SMAX=	3.39	SMIN=	-5.39	TMAX=	4.39	ANGLE=	-30.2
	BOTT:	SMAX=	5.39	SMIN=	-3.39	TMAX=	4.39	ANGLE=	-30.2

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ELEMENT	LOAD	QX	QY FX	MX FY	MY FXY	MAXY			
111	1	0.00	1.50 0.00	-0.02 0.00	-1.27 0.00	0.00			
	TOP :	SMAX=	-0.21	SMIN=	-13.57	TMAX=	6.68	ANGLE=	0.0
	BOTT:	SMAX=	13.57	SMIN=	0.21	TMAX=	6.68	ANGLE=	0.0
112	1	0.51	4.02 0.00	0.11 0.00	-0.30 0.00	0.36			
	TOP :	SMAX=	3.39	SMIN=	-5.39	TMAX=	4.39	ANGLE=	30.2
	BOTT:	SMAX=	5.39	SMIN=	-3.39	TMAX=	4.39	ANGLE=	30.2
113	1	0.02	6.27 0.00	0.20 0.00	0.74 0.00	0.15			
	TOP :	SMAX=	8.33	SMIN=	1.73	TMAX=	3.30	ANGLE=	-14.0
	BOTT:	SMAX=	-1.73	SMIN=	-8.33	TMAX=	3.30	ANGLE=	-14.0
114	1	-0.35	5.25 0.00	0.26 0.00	0.74 0.00	0.07			
	TOP :	SMAX=	8.01	SMIN=	2.71	TMAX=	2.65	ANGLE=	-8.1
	BOTT:	SMAX=	-2.71	SMIN=	-8.01	TMAX=	2.65	ANGLE=	-8.1
115	1	-0.77	4.21 0.00	0.14 0.00	0.54 0.00	0.08			
	TOP :	SMAX=	5.94	SMIN=	1.36	TMAX=	2.29	ANGLE=	-10.9
	BOTT:	SMAX=	-1.36	SMIN=	-5.94	TMAX=	2.29	ANGLE=	-10.9
116	1	-0.93	2.16 0.00	0.09 0.00	0.09 0.00	0.08			
	TOP :	SMAX=	1.84	SMIN=	0.11	TMAX=	0.87	ANGLE=	90.0
	BOTT:	SMAX=	-0.11	SMIN=	-1.84	TMAX=	0.87	ANGLE=	90.0
117	1	0.31	-0.09 0.00	-0.10 0.00	-0.28 0.00	0.13			
	TOP :	SMAX=	-0.30	SMIN=	-3.71	TMAX=	1.70	ANGLE=	27.9
	BOTT:	SMAX=	3.71	SMIN=	0.30	TMAX=	1.70	ANGLE=	27.9
118	1	-0.35	-0.18 0.00	-0.11 0.00	-0.26 0.00	-0.16			
	TOP :	SMAX=	-0.06	SMIN=	-3.85	TMAX=	1.89	ANGLE=	-31.9
	BOTT:	SMAX=	3.85	SMIN=	0.06	TMAX=	1.89	ANGLE=	-31.9
119	1	2.69	3.05 0.00	0.45 0.00	0.71 0.00	0.31			
	TOP :	SMAX=	9.79	SMIN=	2.56	TMAX=	3.61	ANGLE=	-33.6
	BOTT:	SMAX=	-2.56	SMIN=	-9.79	TMAX=	3.61	ANGLE=	-33.6
120	1	3.80	5.90 0.00	0.51 0.00	1.99 0.00	0.38			
	TOP :	SMAX=	22.18	SMIN=	4.41	TMAX=	8.89	ANGLE=	-13.6
	BOTT:	SMAX=	-4.41	SMIN=	-22.18	TMAX=	8.89	ANGLE=	-13.6

ELEMENT FORCES FORCE, LENGTH UNITS= KIP IN

FORCE OR STRESS = FORCE/WIDTH/THICK, MOMENT = FORCE-LENGTH/WIDTH

ELEMENT	LOAD	QX	QY FX	MX FY	MY FXY	MXY
121	1	2.54	7.18 0.00	0.64 0.00	2.42 0.00	0.34
TOP :	SMAX=	26.42	SMIN= 6.14	TMAX=	10.14	ANGLE= -10.4
BOTT:	SMAX=	-6.14	SMIN= -26.42	TMAX=	10.14	ANGLE= -10.4
122	1	2.76	9.63 0.00	0.76 0.00	3.08 0.00	0.28
TOP :	SMAX=	33.23	SMIN= 7.75	TMAX=	12.74	ANGLE= -6.7
BOTT:	SMAX=	-7.75	SMIN= -33.23	TMAX=	12.74	ANGLE= -6.7
123	1	0.63	5.67 0.00	0.17 0.00	0.96 0.00	-0.70
TOP :	SMAX=	14.56	SMIN= -2.51	TMAX=	8.53	ANGLE= 30.2
BOTT:	SMAX=	2.51	SMIN= -14.56	TMAX=	8.53	ANGLE= 30.2
124	1	0.00	3.38 0.00	1.17 0.00	-1.20 0.00	0.00
TOP :	SMAX=	12.45	SMIN= -12.85	TMAX=	12.65	ANGLE= 0.0
BOTT:	SMAX=	12.85	SMIN= -12.45	TMAX=	12.65	ANGLE= 0.0
125	1	-0.63	5.67 0.00	0.17 0.00	0.96 0.00	0.70
TOP :	SMAX=	14.56	SMIN= -2.51	TMAX=	8.53	ANGLE= -30.2
BOTT:	SMAX=	2.51	SMIN= -14.56	TMAX=	8.53	ANGLE= -30.2
126	1	-2.76	9.63 0.00	0.76 0.00	3.08 0.00	-0.28
TOP :	SMAX=	33.23	SMIN= 7.75	TMAX=	12.74	ANGLE= 6.7
BOTT:	SMAX=	-7.75	SMIN= -33.23	TMAX=	12.74	ANGLE= 6.7
127	1	-2.54	7.18 0.00	0.64 0.00	2.42 0.00	-0.34
TOP :	SMAX=	26.42	SMIN= 6.14	TMAX=	10.14	ANGLE= 10.4
BOTT:	SMAX=	-6.14	SMIN= -26.42	TMAX=	10.14	ANGLE= 10.4
128	1	-3.80	5.90 0.00	0.51 0.00	1.99 0.00	-0.38
TOP :	SMAX=	22.18	SMIN= 4.41	TMAX=	8.89	ANGLE= 13.6
BOTT:	SMAX=	-4.41	SMIN= -22.18	TMAX=	8.89	ANGLE= 13.6
129	1	-2.69	3.05 0.00	0.45 0.00	0.71 0.00	-0.31
TOP :	SMAX=	9.79	SMIN= 2.56	TMAX=	3.61	ANGLE= 33.6
BOTT:	SMAX=	-2.56	SMIN= -9.79	TMAX=	3.61	ANGLE= 33.6
130	1	0.35	-0.18 0.00	-0.11 0.00	-0.26 0.00	0.16
TOP :	SMAX=	-0.06	SMIN= -3.85	TMAX=	1.89	ANGLE= 31.9
BOTT:	SMAX=	3.85	SMIN= 0.06	TMAX=	1.89	ANGLE= 31.9

ELEMENT FORCES FORCE, LENGTH UNITS= KIP IN

FORCE OR STRESS = FORCE/WIDTH/THICK, MOMENT = FORCE-LENGTH/WIDTH

ELEMENT	LOAD	QX	QY FX	MX FY	MY FGY	MX
131	1	0.28	0.12 0.00	-0.07 0.00	0.00 0.00	-0.09
	TOP :	SMAX= 0.63	SMIN= -1.34	TMAX= 0.98	ANGLE= 33.6	
	BOTT:	SMAX= 1.34	SMIN= -0.63	TMAX= 0.98	ANGLE= 33.6	
132	1	1.20	0.60 0.00	0.20 0.00	-0.13 0.00	-0.02
	TOP :	SMAX= 2.17	SMIN= -1.39	TMAX= 1.78	ANGLE= -4.1	
	BOTT:	SMAX= 1.39	SMIN= -2.17	TMAX= 1.78	ANGLE= -4.1	
133	1	3.72	3.58 0.00	-0.06 0.00	-0.57 0.00	-0.38
	TOP :	SMAX= 1.60	SMIN= -8.27	TMAX= 4.93	ANGLE= -28.1	
	BOTT:	SMAX= 8.27	SMIN= -1.60	TMAX= 4.93	ANGLE= -28.1	
134	1	2.29	3.67 0.00	-0.14 0.00	-0.58 0.00	-0.30
	TOP :	SMAX= 0.09	SMIN= -7.86	TMAX= 3.98	ANGLE= -26.9	
	BOTT:	SMAX= 7.86	SMIN= -0.09	TMAX= 3.98	ANGLE= -26.9	
135	1	2.96	4.54 0.00	-0.27 0.00	-0.85 0.00	-0.41
	TOP :	SMAX= -0.63	SMIN= -11.31	TMAX= 5.34	ANGLE= -27.2	
	BOTT:	SMAX= 11.31	SMIN= 0.63	TMAX= 5.34	ANGLE= -27.2	
136	1	6.11	3.60 0.00	-0.14 0.00	-0.53 0.00	-1.05
	TOP :	SMAX= 7.84	SMIN= -14.93	TMAX= 11.39	ANGLE= -39.7	
	BOTT:	SMAX= 14.93	SMIN= -7.84	TMAX= 11.39	ANGLE= -39.7	
137	1	0.00	-1.60 0.00	1.74 0.00	0.51 0.00	0.00
	TOP :	SMAX= 18.55	SMIN= 5.47	TMAX= 6.54	ANGLE= 0.0	
	BOTT:	SMAX= -5.47	SMIN= -18.55	TMAX= 6.54	ANGLE= 0.0	
138	1	-6.11	3.60 0.00	-0.14 0.00	-0.53 0.00	1.05
	TOP :	SMAX= 7.84	SMIN= -14.93	TMAX= 11.39	ANGLE= 39.7	
	BOTT:	SMAX= 14.93	SMIN= -7.84	TMAX= 11.39	ANGLE= 39.7	
139	1	-2.96	4.54 0.00	-0.27 0.00	-0.85 0.00	0.41
	TOP :	SMAX= -0.63	SMIN= -11.31	TMAX= 5.34	ANGLE= 27.2	
	BOTT:	SMAX= 11.31	SMIN= 0.63	TMAX= 5.34	ANGLE= 27.2	
140	1	-2.29	3.67 0.00	-0.14 0.00	-0.58 0.00	0.30
	TOP :	SMAX= 0.09	SMIN= -7.86	TMAX= 3.98	ANGLE= 26.9	
	BOTT:	SMAX= 7.86	SMIN= -0.09	TMAX= 3.98	ANGLE= 26.9	

ELEMENT FORCES FORCE, LENGTH UNITS= KIP IN

FORCE OR STRESS = FORCE/WIDTH/THICK, MOMENT = FORCE-LENGTH/WIDTH

ELEMENT	LOAD	QX	QY FX	MX FY	MY FXY	MX	MY
141	1	-3.72	3.58 0.00	-0.06 0.00	-0.57 0.00	0.38	
	TOP :	SMAX= 1.60	SMIN= -8.27	TMAX= 4.93	ANGLE= 28.1		
	BOTT:	SMAX= 8.27	SMIN= -1.60	TMAX= 4.93	ANGLE= 28.1		
142	1	-1.20	0.60 0.00	0.20 0.00	-0.13 0.00	0.02	
	TOP :	SMAX= 2.17	SMIN= -1.39	TMAX= 1.78	ANGLE= 4.1		
	BOTT:	SMAX= 1.39	SMIN= -2.17	TMAX= 1.78	ANGLE= 4.1		
143	1	-0.28	0.12 0.00	-0.07 0.00	0.00 0.00	0.09	
	TOP :	SMAX= 0.63	SMIN= -1.34	TMAX= 0.98	ANGLE= -33.6		
	BOTT:	SMAX= 1.34	SMIN= -0.63	TMAX= 0.98	ANGLE= -33.6		

*****END OF ELEMENT FORCES*****

78. PRINT DISPLACEMENTS

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JOINT DISPLACEMENT (INCH RADIANS)

STRUCTURE TYPE = SPACE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
1	1	0.00000	0.00000	0.00011	-0.00017	-0.00028	0.00000
2	1	0.00000	0.00000	0.00054	-0.00033	-0.00038	0.00000
3	1	0.00000	0.00000	0.00104	-0.00018	-0.00038	0.00000
4	1	0.00000	0.00000	0.00144	-0.00026	-0.00023	0.00000
5	1	0.00000	0.00000	0.00172	-0.00022	-0.00019	0.00000
6	1	0.00000	0.00000	0.00210	-0.00041	-0.00029	0.00000
7	1	0.00000	0.00000	0.00295	-0.00185	-0.00015	0.00000
8	1	0.00000	0.00000	0.00295	-0.00185	0.00015	0.00000
9	1	0.00000	0.00000	0.00210	-0.00041	0.00029	0.00000
10	1	0.00000	0.00000	0.00172	-0.00022	0.00019	0.00000
11	1	0.00000	0.00000	0.00144	-0.00026	0.00023	0.00000
12	1	0.00000	0.00000	0.00104	-0.00018	0.00038	0.00000
13	1	0.00000	0.00000	0.00054	-0.00033	0.00038	0.00000
14	1	0.00000	0.00000	0.00011	-0.00017	0.00028	0.00000
15	1	0.00000	0.00000	0.00004	-0.00014	-0.00030	0.00000
16	1	0.00000	0.00000	0.00038	-0.00037	-0.00039	0.00000
17	1	0.00000	0.00000	0.00088	0.00000	0.00000	0.00000
18	1	0.00000	0.00000	0.00124	0.00000	0.00000	0.00000
19	1	0.00000	0.00000	0.00151	0.00000	0.00000	0.00000
20	1	0.00000	0.00000	0.00178	0.00000	0.00000	0.00000
21	1	0.00000	0.00000	0.00214	-0.00181	-0.00016	0.00000
22	1	0.00000	0.00000	0.00214	-0.00181	0.00016	0.00000
23	1	0.00000	0.00000	0.00178	0.00000	0.00000	0.00000
24	1	0.00000	0.00000	0.00151	0.00000	0.00000	0.00000
25	1	0.00000	0.00000	0.00124	0.00000	0.00000	0.00000
26	1	0.00000	0.00000	0.00088	0.00000	0.00000	0.00000
27	1	0.00000	0.00000	0.00038	-0.00037	0.00039	0.00000
28	1	0.00000	0.00000	0.00004	-0.00014	0.00030	0.00000
29	1	0.00000	0.00000	-0.00005	-0.00010	-0.00020	0.00000
30	1	0.00000	0.00000	0.00019	-0.00024	-0.00026	0.00000
31	1	0.00000	0.00000	0.00048	-0.00048	-0.00028	0.00000
32	1	0.00000	0.00000	0.00066	-0.00063	-0.00026	0.00000
33	1	0.00000	0.00000	0.00084	-0.00077	-0.00018	0.00000
34	1	0.00000	0.00000	0.00093	-0.00089	-0.00014	0.00000
35	1	0.00000	0.00000	0.00104	-0.00102	-0.00001	0.00000
36	1	0.00000	0.00000	0.00104	-0.00102	0.00001	0.00000
37	1	0.00000	0.00000	0.00093	-0.00089	0.00014	0.00000
38	1	0.00000	0.00000	0.00084	-0.00077	0.00018	0.00000
39	1	0.00000	0.00000	0.00066	-0.00063	0.00026	0.00000
40	1	0.00000	0.00000	0.00048	-0.00048	0.00028	0.00000
41	1	0.00000	0.00000	0.00019	-0.00024	0.00026	0.00000
42	1	0.00000	0.00000	-0.00005	-0.00010	0.00020	0.00000
43	1	0.00000	0.00000	-0.00006	-0.00002	-0.00008	0.00000
44	1	0.00000	0.00000	0.00002	-0.00011	-0.00009	0.00000
45	1	0.00000	0.00000	0.00009	-0.00027	-0.00007	0.00000
46	1	0.00000	0.00000	0.00014	-0.00038	-0.00007	0.00000
47	1	0.00000	0.00000	0.00020	-0.00044	-0.00007	0.00000
48	1	0.00000	0.00000	0.00030	-0.00045	-0.00015	0.00000

JOINT DISPLACEMENT (INCH RADIANS)

STRUCTURE TYPE = SPACE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
49	1	0.00000	0.00000	0.00050	0.00000	0.00000	0.00000
50	1	0.00000	0.00000	0.00050	0.00000	0.00000	0.00000
51	1	0.00000	0.00000	0.00030	-0.00045	0.00015	0.00000
52	1	0.00000	0.00000	0.00020	-0.00044	0.00007	0.00000
53	1	0.00000	0.00000	0.00014	-0.00038	0.00007	0.00000
54	1	0.00000	0.00000	0.00009	-0.00027	0.00007	0.00000
55	1	0.00000	0.00000	0.00002	-0.00011	0.00009	0.00000
56	1	0.00000	0.00000	-0.00006	-0.00002	0.00008	0.00000
57	1	0.00000	0.00000	-0.00004	0.00000	-0.00001	0.00000
58	1	0.00000	0.00000	-0.00003	-0.00003	-0.00001	0.00000
59	1	0.00000	0.00000	-0.00004	-0.00008	0.00000	0.00000
60	1	0.00000	0.00000	-0.00004	-0.00011	0.00000	0.00000
61	1	0.00000	0.00000	-0.00002	-0.00012	-0.00008	0.00000
62	1	0.00000	0.00000	0.00014	-0.00010	-0.00023	0.00000
63	1	0.00000	0.00000	0.00040	0.00000	0.00000	0.00000
64	1	0.00000	0.00000	0.00040	0.00000	0.00000	0.00000
65	1	0.00000	0.00000	0.00014	-0.00010	0.00023	0.00000
66	1	0.00000	0.00000	-0.00002	-0.00012	0.00008	0.00000
67	1	0.00000	0.00000	-0.00004	-0.00011	0.00000	0.00000
68	1	0.00000	0.00000	-0.00004	-0.00008	0.00000	0.00000
69	1	0.00000	0.00000	-0.00003	-0.00003	0.00001	0.00000
70	1	0.00000	0.00000	-0.00004	0.00000	0.00001	0.00000
71	1	0.00000	0.00000	-0.00004	-0.00001	0.00001	0.00000
72	1	0.00000	0.00000	-0.00005	-0.00001	0.00001	0.00000
73	1	0.00000	0.00000	-0.00006	0.00000	0.00002	0.00000
74	1	0.00000	0.00000	-0.00008	0.00000	0.00001	0.00000
75	1	0.00000	0.00000	-0.00006	-0.00001	-0.00008	0.00000
76	1	0.00000	0.00000	0.00010	-0.00002	-0.00024	0.00000
77	1	0.00000	0.00000	0.00036	0.00000	0.00000	0.00000
78	1	0.00000	0.00000	0.00036	0.00000	0.00000	0.00000
79	1	0.00000	0.00000	0.00010	-0.00002	0.00024	0.00000
80	1	0.00000	0.00000	-0.00006	-0.00001	0.00008	0.00000
81	1	0.00000	0.00000	-0.00008	0.00000	-0.00001	0.00000
82	1	0.00000	0.00000	-0.00006	0.00000	-0.00002	0.00000
83	1	0.00000	0.00000	-0.00005	-0.00001	-0.00001	0.00000
84	1	0.00000	0.00000	-0.00004	-0.00001	-0.00001	0.00000
85	1	0.00000	0.00000	-0.00007	-0.00001	-0.00002	0.00000
86	1	0.00000	0.00000	-0.00004	0.00004	-0.00002	0.00000
87	1	0.00000	0.00000	-0.00004	0.00011	0.00000	0.00000
88	1	0.00000	0.00000	-0.00004	0.00015	-0.00001	0.00000
89	1	0.00000	0.00000	-0.00002	0.00017	-0.00007	0.00000
90	1	0.00000	0.00000	0.00011	0.00015	-0.00020	0.00000
91	1	0.00000	0.00000	0.00034	0.00000	0.00000	0.00000
92	1	0.00000	0.00000	0.00034	0.00000	0.00000	0.00000
93	1	0.00000	0.00000	0.00011	0.00015	0.00020	0.00000
94	1	0.00000	0.00000	-0.00002	0.00017	0.00007	0.00000
95	1	0.00000	0.00000	-0.00004	0.00015	0.00001	0.00000
96	1	0.00000	0.00000	-0.00004	0.00011	0.00000	0.00000

JOINT DISPLACEMENT (INCH RADIANS)

STRUCTURE TYPE = SPACE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
97	1	0.00000	0.00000	-0.00004	0.00004	0.00002	0.00000
98	1	0.00000	0.00000	-0.00007	-0.00001	0.00002	0.00000
99	1	0.00000	0.00000	-0.00009	0.00007	-0.00013	0.00000
100	1	0.00000	0.00000	0.00004	0.00019	-0.00013	0.00000
101	1	0.00000	0.00000	0.00015	0.00040	-0.00011	0.00000
102	1	0.00000	0.00000	0.00022	0.00054	-0.00010	0.00000
103	1	0.00000	0.00000	0.00030	0.00066	-0.00009	0.00000
104	1	0.00000	0.00000	0.00039	0.00067	-0.00014	0.00000
105	1	0.00000	0.00000	0.00059	0.00062	-0.00006	0.00000
106	1	0.00000	0.00000	0.00059	0.00062	0.00006	0.00000
107	1	0.00000	0.00000	0.00039	0.00067	0.00014	0.00000
108	1	0.00000	0.00000	0.00030	0.00066	0.00009	0.00000
109	1	0.00000	0.00000	0.00022	0.00054	0.00010	0.00000
110	1	0.00000	0.00000	0.00015	0.00040	0.00011	0.00000
111	1	0.00000	0.00000	0.00004	0.00019	0.00013	0.00000
112	1	0.00000	0.00000	-0.00009	0.00007	0.00013	0.00000
113	1	0.00000	0.00000	-0.00002	0.00027	-0.00033	0.00000
114	1	0.00000	0.00000	0.00032	0.00043	-0.00036	0.00000
115	1	0.00000	0.00000	0.00072	0.00070	-0.00032	0.00000
116	1	0.00000	0.00000	0.00098	0.00088	-0.00032	0.00000
117	1	0.00000	0.00000	0.00123	0.00109	-0.00023	0.00000
118	1	0.00000	0.00000	0.00140	0.00129	-0.00018	0.00000
119	1	0.00000	0.00000	0.00151	0.00156	0.00001	0.00000
120	1	0.00000	0.00000	0.00151	0.00156	-0.00001	0.00000
121	1	0.00000	0.00000	0.00140	0.00129	0.00018	0.00000
122	1	0.00000	0.00000	0.00123	0.00109	0.00023	0.00000
123	1	0.00000	0.00000	0.00098	0.00088	0.00032	0.00000
124	1	0.00000	0.00000	0.00072	0.00070	0.00032	0.00000
125	1	0.00000	0.00000	0.00032	0.00043	0.00036	0.00000
126	1	0.00000	0.00000	-0.00002	0.00027	0.00033	0.00000
127	1	0.00000	0.00000	0.00010	0.00036	-0.00040	0.00000
128	1	0.00000	0.00000	0.00055	0.00056	-0.00044	0.00000
129	1	0.00000	0.00000	0.00114	0.00051	-0.00033	0.00000
130	1	0.00000	0.00000	0.00151	0.00064	-0.00031	0.00000
131	1	0.00000	0.00000	0.00188	0.00076	-0.00025	0.00000
132	1	0.00000	0.00000	0.00219	0.00103	-0.00027	0.00000
133	1	0.00000	0.00000	0.00236	0.00210	-0.00010	0.00000
134	1	0.00000	0.00000	0.00236	0.00210	0.00010	0.00000
135	1	0.00000	0.00000	0.00219	0.00103	0.00027	0.00000
136	1	0.00000	0.00000	0.00188	0.00076	0.00025	0.00000
137	1	0.00000	0.00000	0.00151	0.00064	0.00031	0.00000
138	1	0.00000	0.00000	0.00114	0.00051	0.00033	0.00000
139	1	0.00000	0.00000	0.00055	0.00056	0.00044	0.00000
140	1	0.00000	0.00000	0.00010	0.00036	0.00040	0.00000
141	1	0.00000	0.00000	0.00024	0.00036	-0.00044	0.00000
142	1	0.00000	0.00000	0.00072	0.00070	-0.00049	0.00000
143	1	0.00000	0.00000	0.00135	0.00000	0.00000	0.00000
144	1	0.00000	0.00000	0.00182	0.00000	0.00000	0.00000

JOINT DISPLACEMENT (INCH RADIANS)

STRUCTURE TYPE = SPACE

JOINT	LOAD	X-TRANS	Y-TRANS	Z-TRANS	X-ROTAN	Y-ROTAN	Z-ROTAN
145	1	0.00000	0.00000	0.00222	0.00000	0.00000	0.00000
146	1	0.00000	0.00000	0.00269	0.00000	0.00000	0.00000
147	1	0.00000	0.00000	0.00317	0.00256	-0.00032	0.00000
148	1	0.00000	0.00000	0.00317	0.00256	0.00032	0.00000
149	1	0.00000	0.00000	0.00269	0.00000	0.00000	0.00000
150	1	0.00000	0.00000	0.00222	0.00000	0.00000	0.00000
151	1	0.00000	0.00000	0.00182	0.00000	0.00000	0.00000
152	1	0.00000	0.00000	0.00135	0.00000	0.00000	0.00000
153	1	0.00000	0.00000	0.00072	0.00070	0.00049	0.00000
154	1	0.00000	0.00000	0.00024	0.00036	0.00044	0.00000
155	1	0.00000	0.00000	0.00042	0.00041	-0.00039	0.00000
156	1	0.00000	0.00000	0.00102	0.00063	-0.00050	0.00000
157	1	0.00000	0.00000	0.00154	0.00022	-0.00047	0.00000
158	1	0.00000	0.00000	0.00201	0.00025	-0.00033	0.00000
159	1	0.00000	0.00000	0.00243	0.00021	-0.00033	0.00000
160	1	0.00000	0.00000	0.00302	0.00045	-0.00044	0.00000
161	1	0.00000	0.00000	0.00423	0.00253	-0.00014	0.00000
162	1	0.00000	0.00000	0.00423	0.00253	0.00014	0.00000
163	1	0.00000	0.00000	0.00302	0.00045	0.00044	0.00000
164	1	0.00000	0.00000	0.00243	0.00021	0.00033	0.00000
165	1	0.00000	0.00000	0.00201	0.00025	0.00033	0.00000
166	1	0.00000	0.00000	0.00154	0.00022	0.00047	0.00000
167	1	0.00000	0.00000	0.00102	0.00063	0.00050	0.00000
168	1	0.00000	0.00000	0.00042	0.00041	0.00039	0.00000

***** END OF LATEST ANALYSIS RESULT *****

79. PLOT STRESS FILE
 80. PLOT DISPLACEMENT FILE
 81. PLOT SECTION FILE
 82. FINISH

***** END OF STAAD-III *****

DATE= JUN 21,1996 TIME= 15: 5:33 *****

 * For questions on STAAD-III/ISDS, contact: *
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